THERMAL PRINTER

stx-80

stx-80T

TECHNICAL MANUAL

(PRELIMINARY)

star micronics·inc

INTRODUCTION

This manual is an introduction to the STX-80/STX-80T printer. Only the difference between STX-80 and STX-80T is the pattern of the block graphics (See Fig. 1-17/Fig. 1-19). It is intended for use as a reference for both operational characteristics as well as periodic inspections and maintenance procedures. This manual is prepared for use at a technical level and not for the general user.

This manual is divided into the following sections:

1. General Specifications
2. Printer Installation
3. Theory of Operation
4. Adjustments
5. Parts Replacement
6. Trouble-Shooting Procedures
7. Parts List

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* THE CONTENTS OF THIS MANUAL ARE SUBJECT *
* TO CHANGE WITHOUT NOTICE. *
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1. Outline

This printer is a serial thermal dot matrix operating at 60 CPS. This printer comes equipped with a 7 or 8 bit selectable (Centronics compatible) parallel interface.

1-1 Features

* High precision Bit Image Printing with 480 dots/line
* Bi-directional printing with logic seeking
* Selectable column length
  80 characters/line (standard)
  40 characters/line (enlarged)
  Ability to mix standard characters and enlarged characters in the same line
* Low-noise
* Printing speed of 60 CPS
* Uses 8.5 inches wide heat sensitive roll paper
* Paper self-contained in case
* Two types of Block Graphic Pattern (Factory Set)
  STX-80 ····· Commodore compatible type
  STX-80T ····· Teletext compatible type

2. General Specifications

2-1 Printer Specifications

ITEM	SPECIFICATIONS
Printing System	Serial thermal dot matrix
Interface	Parallel interface (TTL level)
Character Matrix	ASCII characters: 5 × 9 dot matrix Block graphics: 6 × 6 dot matrix Bit image mode: (7 or 8) × 480 dot matrix
Direction of Printing	ASCII characters: Bi-directional, logic seeking Block graphics & Bit image mode: Uni-directional printing from left to right
Number of Print Columns	Standard: 80 columns/line Enlarged: 40 columns/line
Printing Speed	60 characters/second (CPS)
Character Types	96: Standard ASCII character 51: International character 64: Block graphic character
Character Size	Standard: 2.76 (H) × 1.90 (W) mm [7/64 × 5/64 inches] Enlarged: 2.76 (H) × 3.83 (W) mm [7/64 × 5/32 inches]
Character Pitch	Standard: 2.31 mm [1/11 inch] Enlarged: 4.62 mm [1/5.5 inch]
Line Pitch	4.24 mm [1/6 inch], 2.31 mm [1/11 inch], 2.67 mm [7/66 inches], 3.01 mm [4/33 inches] {Programmable}
Paper Feed System	Friction feed
Paper Feed speed	110 msec/line (at 1/6 inch line feed)
Dimensions	352 (W) × 190 (D) × 100 (H) mm [13.9 × 7.5 × 3.9 inches]
Weight	Approx. 3.5 kg [7.7 pounds]
Power Requirement	220 VAC ± 10%, 50/60Hz: 0.25A (Power Consumption) 240 VAC ± 10%, 50/60Hz: 0.25A (Power Consumption)

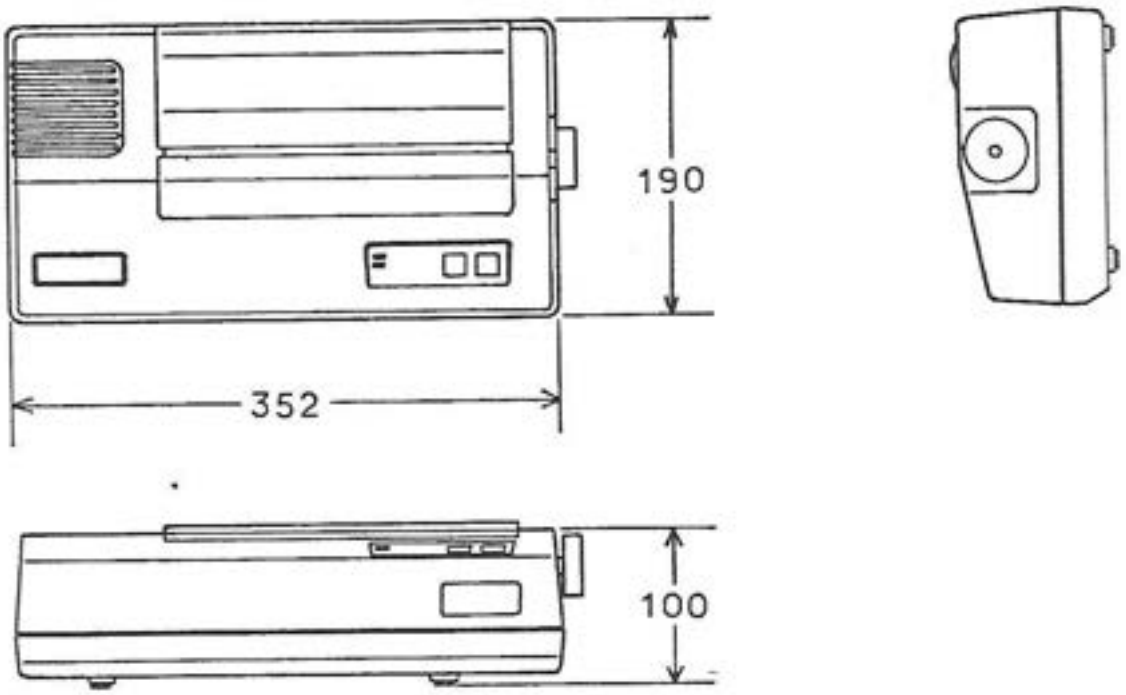


Fig. 1-1 External Dimensions (Unit: mm)

2-2 Form Specifications

ITEM	SPECIFICATIONS
Type	Heat sensitive roll paper
Width	216 mm [8.5 inches]
Roll Diameter	Max. 56 mm [2.2 inches]
Length	Approx. 30 m [98 feet]
Recommended Brand	TP50KS-S (Jujo Paper Mill Co.)

2-3 Reliability Specifications

ITME	SPECIFICATIONS
LIFE	
Printer Mechanism	MCBF 5×10^6 lines(Excluding print head) [5 Million lines] 2×10^7 characters[20 million] or 30 km scan
ENVIRONMENT of Printer Mechanism	
Temperature	0°C ∿ 40°C (Operating) -20°C ∿ +70°C (Storage)
Humidity	Less than 95% RH
ENVIRONMENT of Paper	
Temperature	Less than 60°C (Storage)
Humidity	Less than 90% RH at 40°C (Storage)

3. Dimensions and Organization

3-1 Names of Each Part

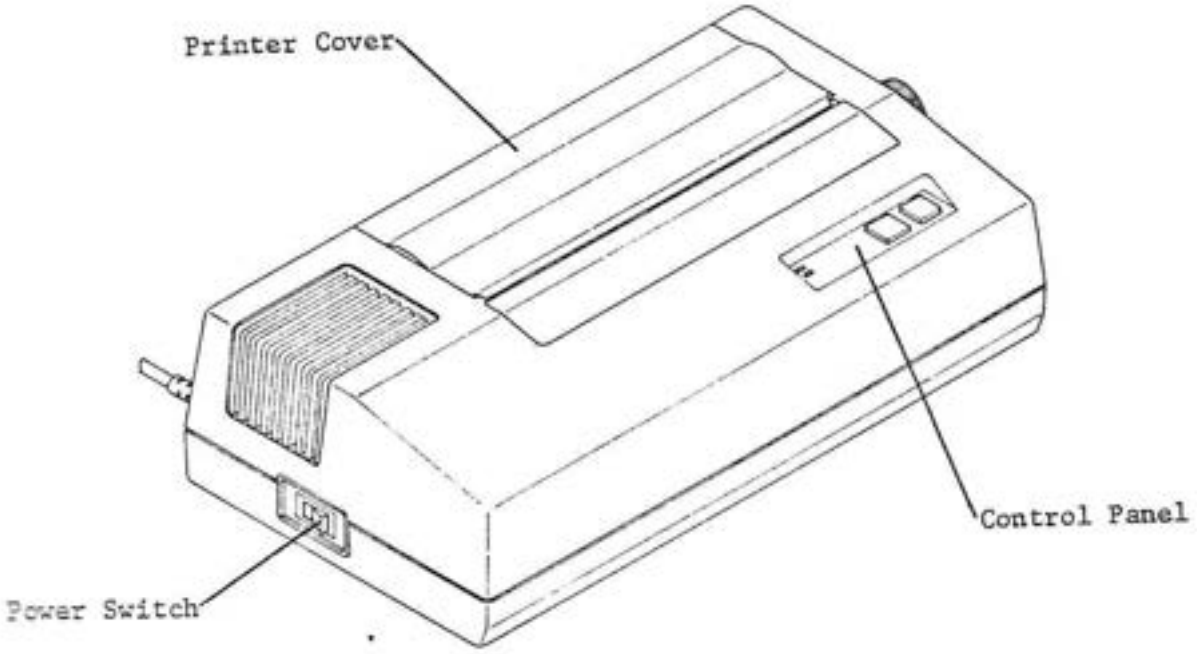


Fig. 1-2 Front View

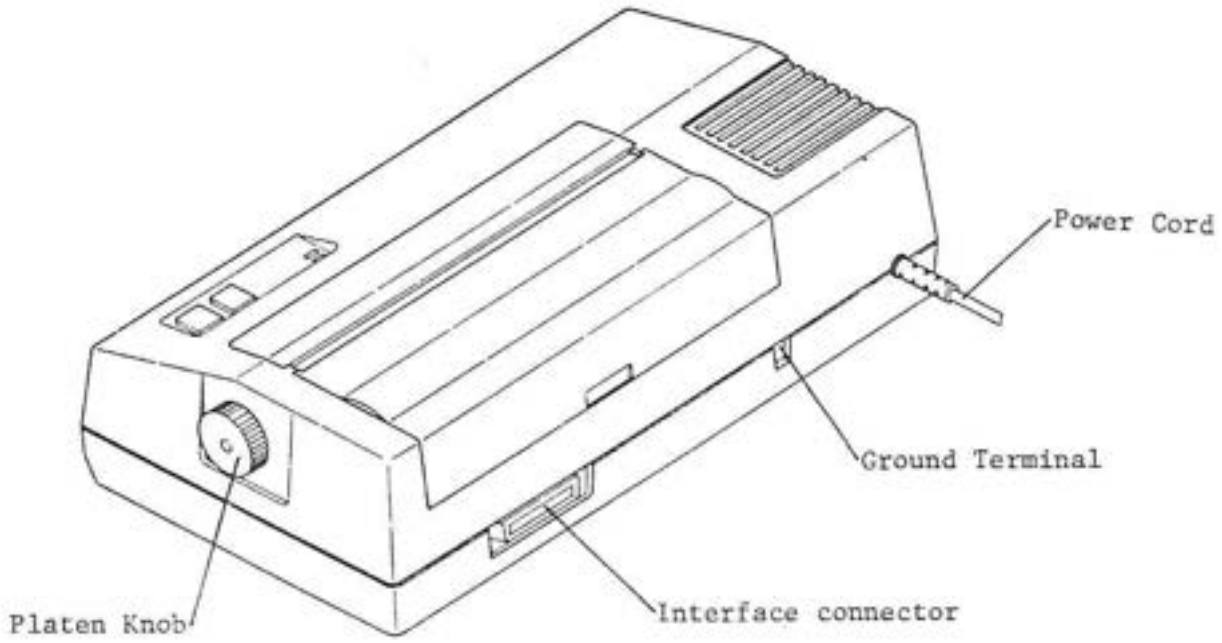


Fig. 1-3 Back View

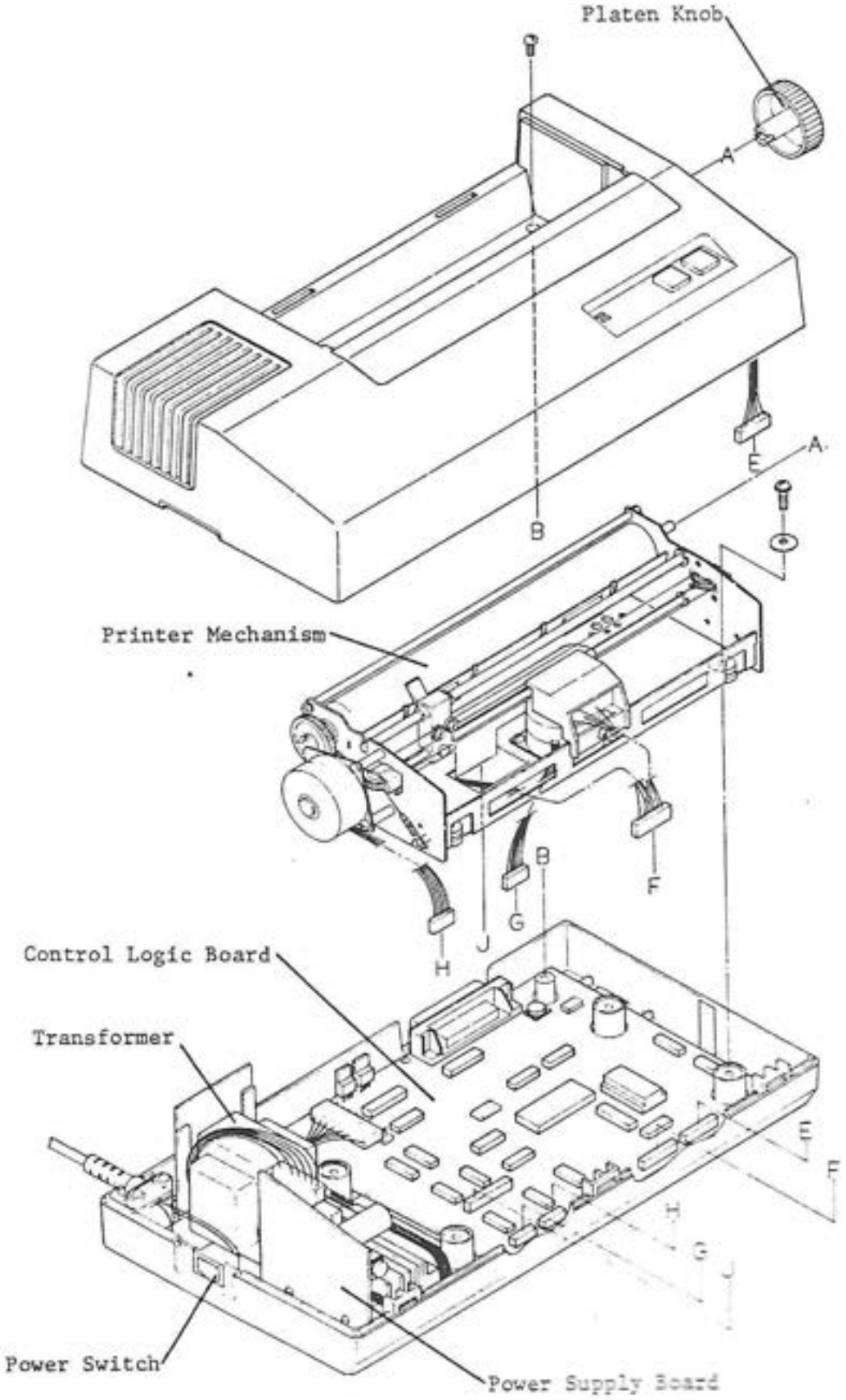


Fig. 1-4 Internal Construction

3-2 Control Panel

The power switch is located at the left rear of the printer, operation switches and indicator lamps (Light Emitting Diode) on the front panel, interface connector is located at the lower rear of the printer.

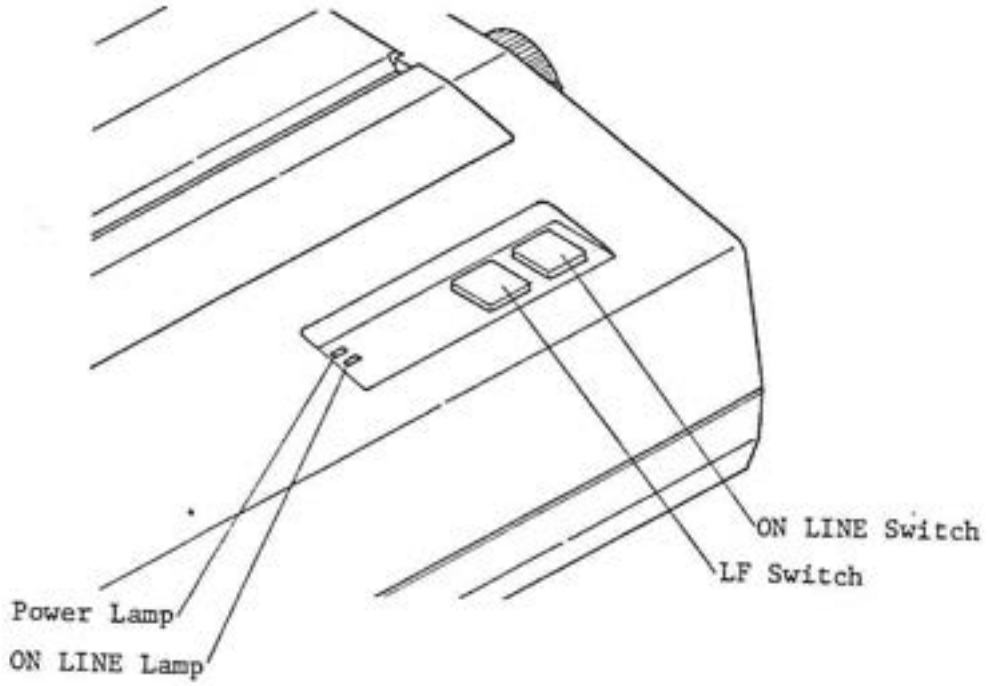


Fig. 1-5 Control Panel

ITEM	CONTENTS
Power Switch	Supply power ON/OFF
ON LINE Switch	Alter the printer status between ON LINE/LOCAL. Printer is in ON LINE status when power is applied.
LF (Line Feed) Switch	When this switch is depressed, paper is fed one line (LOCAL mode only). When this switch is held depressed, consecutive paper feeds are executed.
Power Lamp (Green)	On while power is on.
ON LINE Lamp (Green)	On while printer is ON LINE mode.

3-3 Setting of DIP Switches

The following functions are enabled by appropriately setting the DIP switches at the bottom of the paper holder tray.

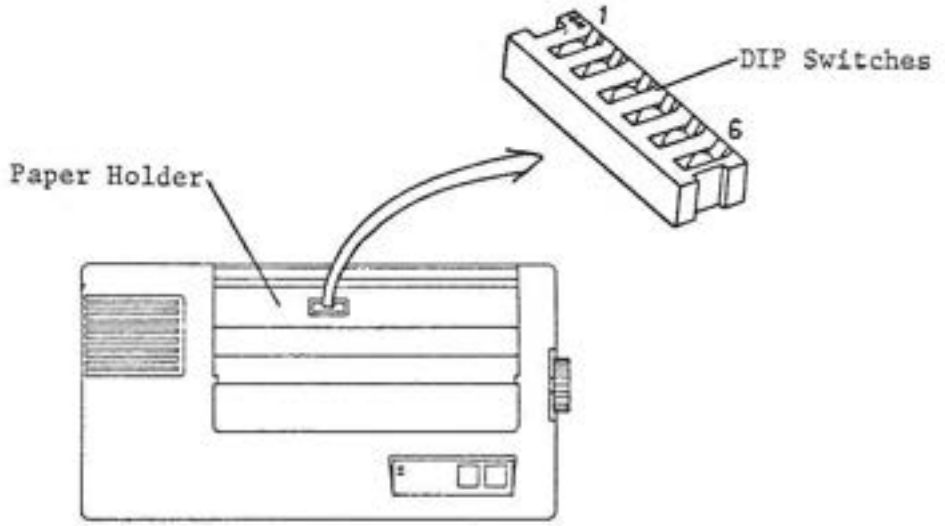


Fig. 1-6 Setting of DIP Switches

DIP SWITCH No.	FUNCTION	ON	OFF
1	Form Length	12 inches (72 lines)	11 inches (66 lines)
2	Automatic Line Feed	Automatic line feed is performed by input of CR code.	Line feed is not performed by input of CR code.
3	7/8 Bit Interface Selection	Interface is set to 7 bits.	Interface is set to 8 bits.
4-6	Selection of International Characters (Refer below)		

Country / DIP Switch No.	U.S.A.	England	Germany	Denmark	France	Sweden	Italy	Spain
4	ON	OFF	ON	OFF	ON	OFF	ON	OFF
5	ON	ON	OFF	OFF	ON	ON	OFF	OFF
6	ON	ON	ON	ON	OFF	OFF	OFF	OFF

3-4 Structure

This printer consists of the following assemblies.

(1) Printer Mechanism Assembly

(2) Control Logic Board Assembly
    (a) Control & drive circuit
    (b) Parallel interface

(3) Power Supply Assembly

Following is the block diagram.

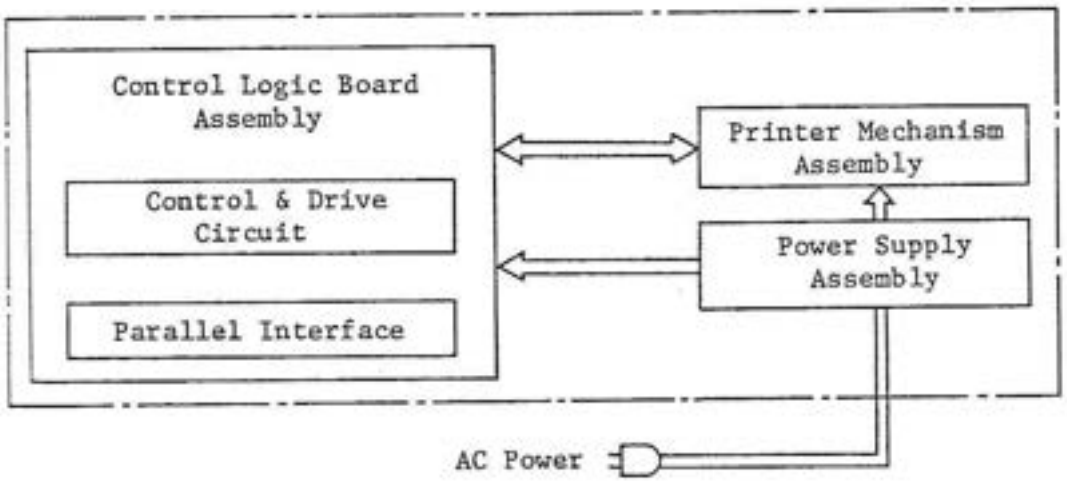


Fig. 1-7 Block Diagram

4. Parallel Interface

4-1 Specifications

(1) Data transfer rate ——— 1,000 -- 6,000 CPS
(2) Synchronization system ——— By $\overline{\text{STROBE}}$ pulses supplied externally.
(3) Handshake ——— By $\overline{\text{ACK}}$ and BUSY signals
(4) Logic level ——— Compatible with TTL level

Signal Name	Circuit Example
DATA 1 - DATA 8 (To Printer)	74LS Compatible 4.7kΩ
$\overline{\text{STROBE}}$ (To Printer)	74LS Compatible 4.7kΩ 100Ω 470pF
BUSY, $\overline{\text{ACK}}$ (From Printer)	74LS Compatible 4.7kΩ

Fig. 1-8 Example of Interface Circuit

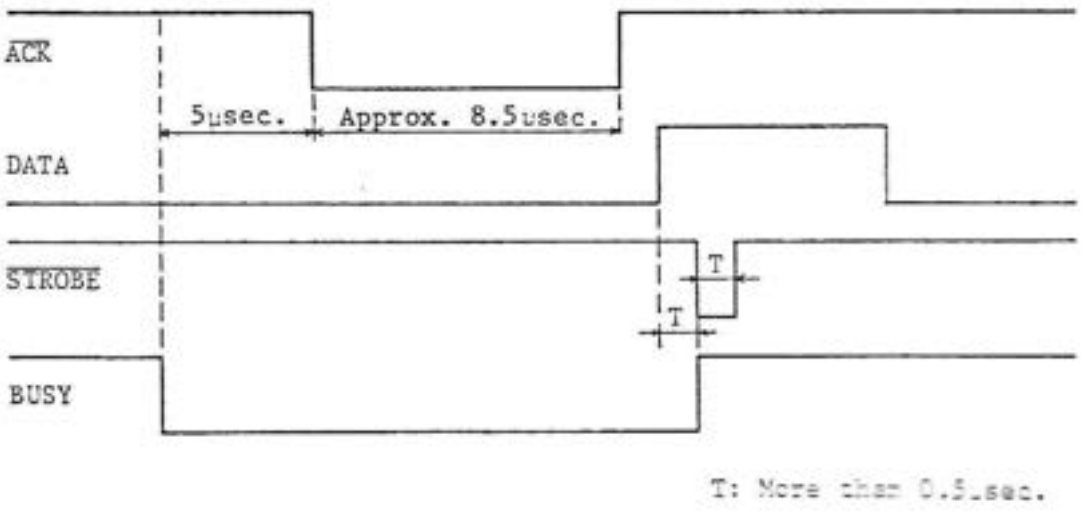


Fig. 1-9 Data Transfer Timing Chart

4-2 Connector Signals and Functional Description

Signal Pin No.	Signal	Direction	Description
1	$\overline{\text{STROBE}}$	IN	Strobe pulse signal to read data in (normally high). When this signal goes low, data is read in.
2	DATA 1	IN	Signals representing parallel Data Bits 1 through 8. When data is "1", the signal level is high; when "0", the signal level is low.
3	DATA 2	IN	
4	DATA 3	IN	
5	DATA 4	IN	
6	DATA 5	IN	
7	DATA 6	IN	
8	DATA 7	IN	
9	DATA 8	IN	
10	$\overline{\text{ACK}}$	OUT	A signal with a pulse width of approx. 8.5 µsec, generated after the data is received. When this signal has been completed, the next data acceptance is permitted.
11	BUSY	OUT	A signal at DC level, which indicates the operating condition of the printer. When this signal level goes low, the next data acceptance is permitted.
12	(NC)	OUT	(TTL,Low level)
13	SELECTED	OUT	A signal at DC level that goes high when the printer is put in ON LINE mode.
14	(NC)		(Unused)
15	(NC)		(Unused)
16	SIGNAL GND		Signal ground
17	CHASSIS GND		Frame Ground
18	EXT +5V	OUT	External supply of +5V DC. 50mA Max.
19	TWISTED PAIR RETURN (PIN 1)		$\overline{\text{STROBE}}$ — Return lines of various signals. Connect a twisted pair cable to each of these pins and its relevant signal pin.
20	TWISTED PAIR RETURN (PIN 2)		DATA 1
21	TWISTED PAIR RETURN (PIN 3)		DATA 2

Signal Pin No.	Signal	Direction	Description
22	TWISTED PAIR RETURN (PIN 4)		DATA 3
23	TWISTED PAIR RETURN (PIN 5)		DATA 4
24	TWISTED PAIR RETURN (PIN 6)		DATA 5
25	TWISTED PAIR RETURN (PIN 7)		DATA 6
26	TWISTED PAIR RETURN (PIN 8)		DATA 7
27	TWISTED PAIR RETURN (PIN 9)		DATA 8
28	TWISTED PAIR RETURN (PIN 10)		$\overline{ACK}$
29	TWISTED PAIR RETURN (PIN 11)		BUSY
30	(NC)		(Unused)
31	(NC)		(Unused)
32	(NC)	OUT	(TTL, High level)
33	EXT.GND		External Ground
34	(NC)		(Unused)
35	(NC)		(Unused)
36	(NC)		(Unused)

Return lines of various signals.
Connect a twisted pair cable to each of these pins and its relevant signal pin.

4-3 Connection of the Printer

Connect your computer to the connector mounted at the rear of the printer via the interface cable and secure the connecting plug with the clamp pins to prevent accidental disconnection.

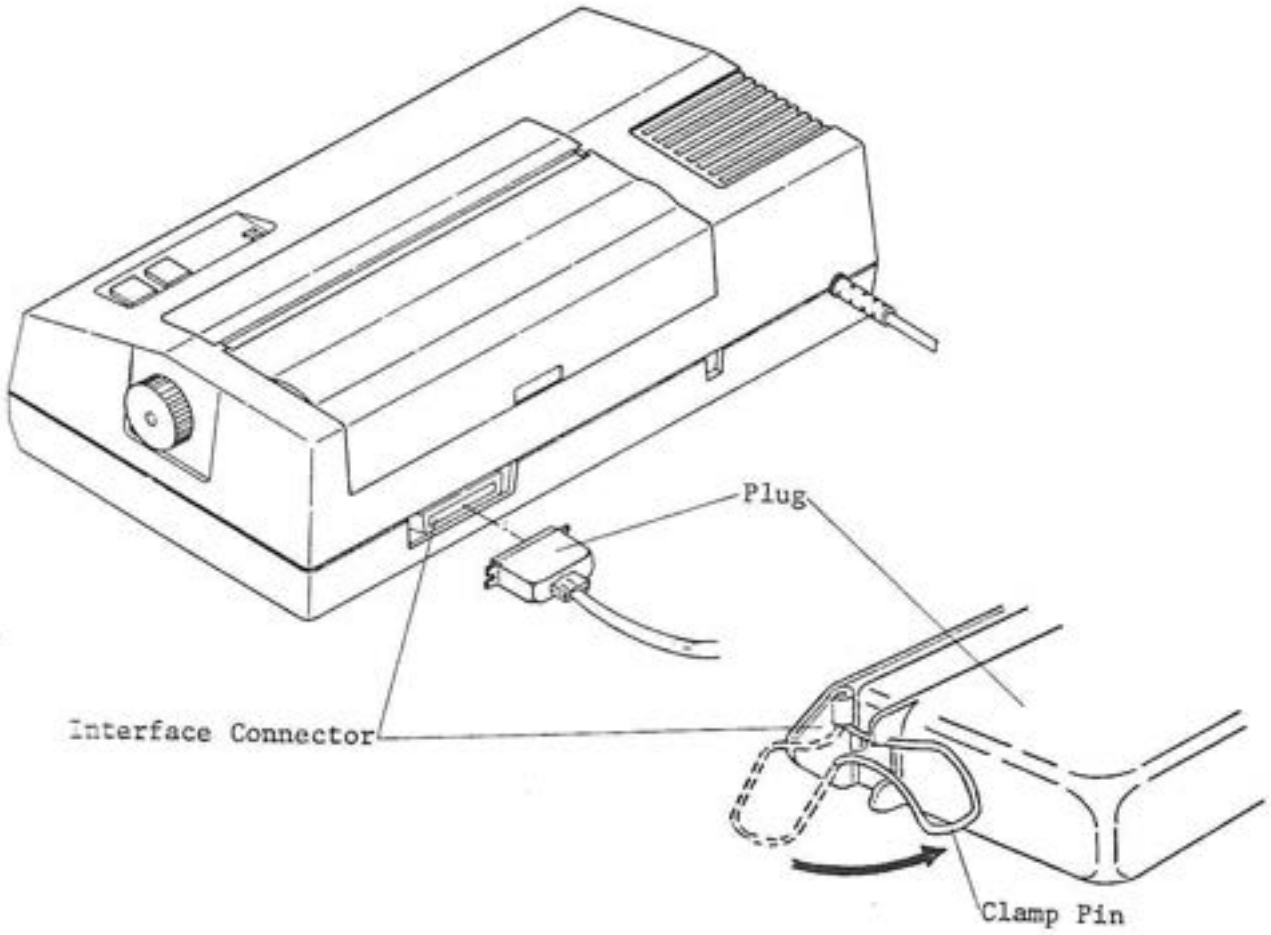


Fig. 1-10 Connection with Interface

** Recommendations for Interface Cable **

1) Connecting plug

57-30360 (AMPHENOL product)

2) Connecting cable

Use the following recommendation whenever possible.

a) Use a twisted pair cable keeping the length as short as possible.

b) Connect the return side of the twisted pair cable to the signal ground.

5. Code Table and Character Style Table

5-1 Standard ASCII Characters & International Characters

This thermal printer is provided with one character ROM as standard. The character ROM permits not only Standard ASCII Characters, but also International Characters and Block Graphics to be printed.

(1) Standard ASCII Characters

DEC		0	16	32	48	64	80	96	112
	HEX	0	1	2	3	4	5	6	7
0	0			SP	0	@	P	`	p
1	1			!	1	A	Q	a	q
2	2		DC2	"	2	B	R	b	r
3	3			#	3	C	S	c	s
4	4		DC4	$	4	D	T	d	t
5	5			%	5	E	U	e	u
6	6			&	6	F	V	f	v
7	7			'	7	G	W	g	w
8	8			(	8	H	X	h	x
9	9	HT		)	9	I	Y	i	y
10	A	LF		*	:	J	Z	j	z
11	B		ESC	+	;	K	[	k	{
12	C	FF		,	<	L	£	l	|
13	D	CR		-	=	M	]	m	}
14	E	SO		.	>	N	^	n	~
15	F	SI		/	?	O	_	o	

Fig. 1-11 Code Table of Standard ASCII Characters

(2) International Characters

The sections outlined in the list above can be converted to International Characters as shown in Fig. 1-12.

HEX / DEC / Country	23	40	5B	5C	5D	5E	60	7B	7C	7D	7E
	35	64	91	92	93	94	96	123	124	125	126
U. S. A.	#	@	[	£	]	^	`	{	|	}	~
France	£	à	°	ç	§	^	¨	é	ù	è	¨
Germany	#	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
England	£	@	[	\	]	^	`	{	|	}	~
Denmark	#	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	§	°	ç	é	^	ù	à	ò	è	ì
Spain	#	@	¡	Ñ	¿	^	`	¨	ñ	}	~

Fig. 1-12 Code Table of International Characters

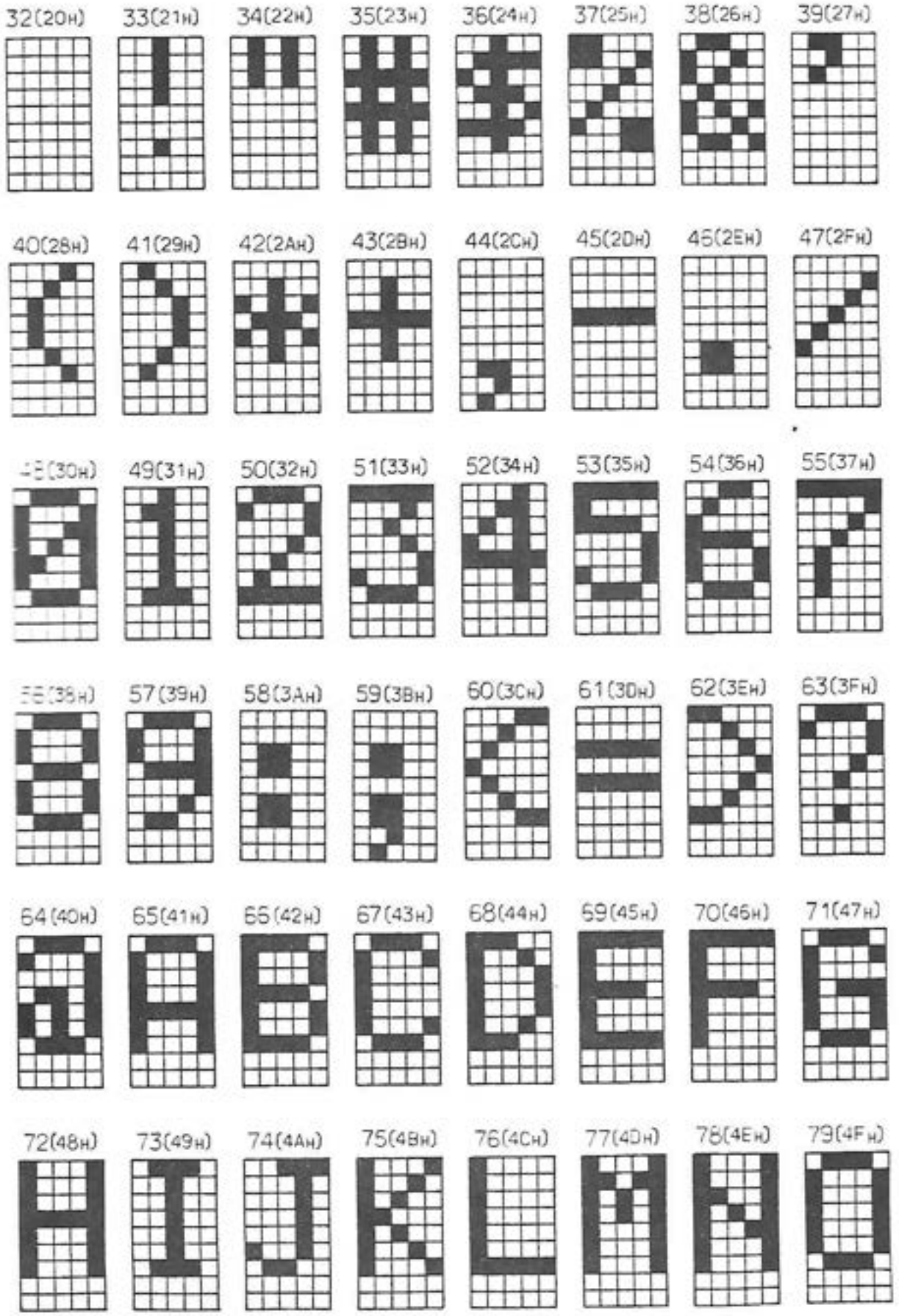


Fig. 1-13 Standard ASCII Character Style Table(1)

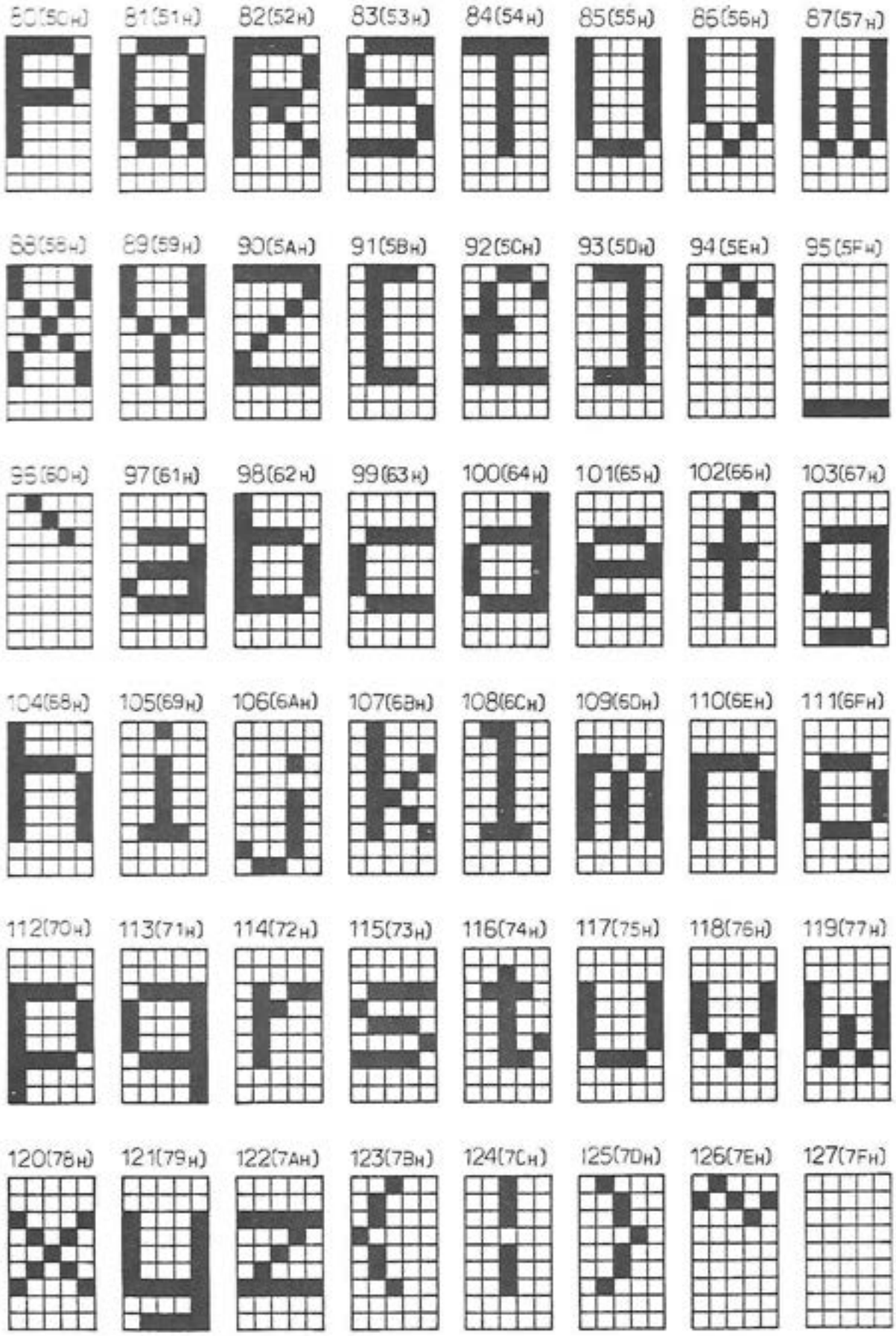


Fig. 1-14 Standerd ASCII Character Style Table(2)

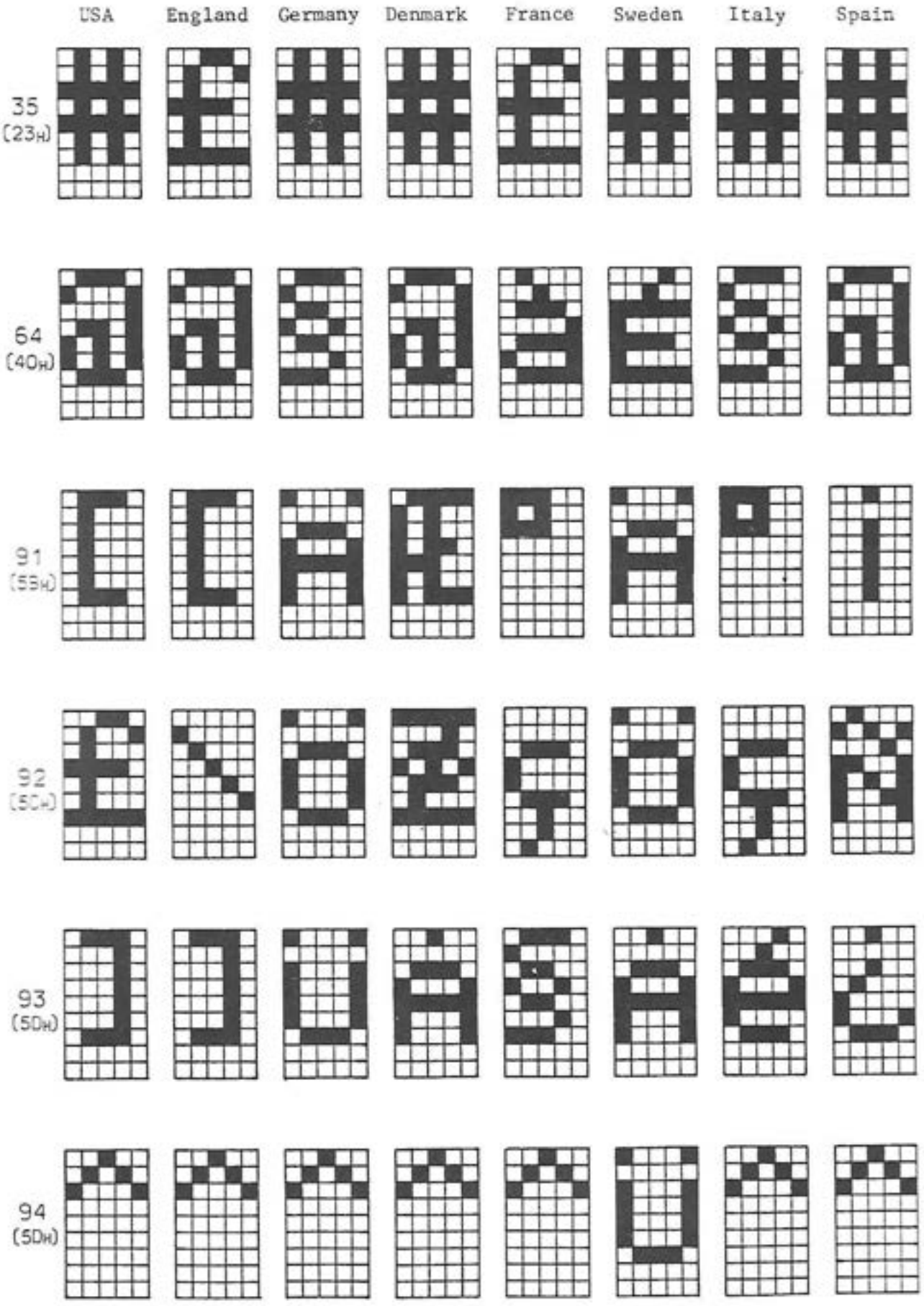


Fig. 1-15 International Character Style Table (1)

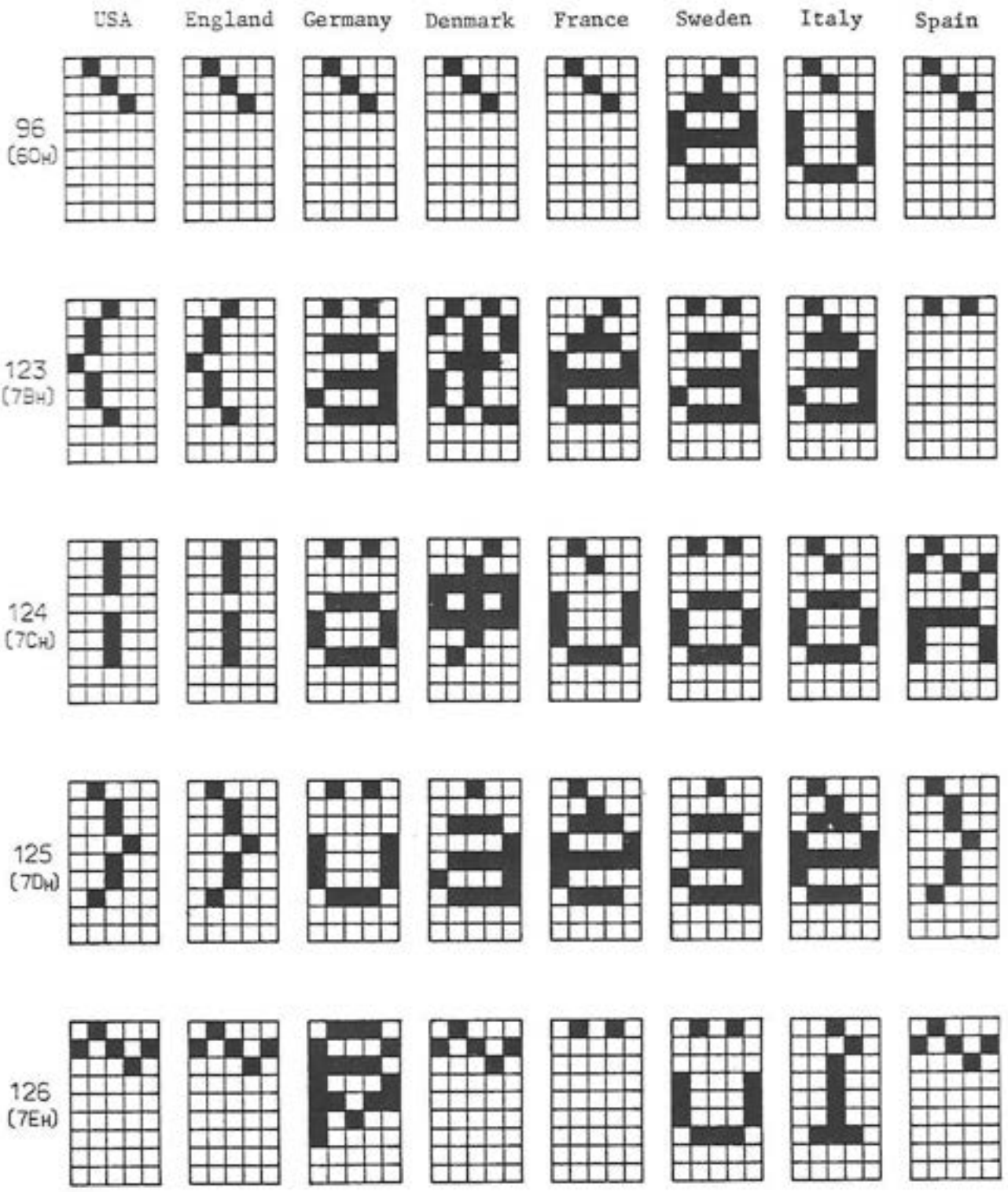


Fig. 1-16 International Character Style Table (2)

5-2 Block Graphic Characters

There are two types of block graphic characters.

(1) STX-80 Type

As shown in Fig. 1-17, the block graphic characters in STX-80 are compatible to the Commodore Computers.
These characters can be printed by the control code "SI".

DEC		0	16	32	48	64	80	96	112
	HEX	0	1	2	3	4	5	6	7
0	0								
1	1								
2	2								
3	3								
4	4								
5	5								
6	6								
7	7								
8	8								
9	9								
10	A								
11	B								
12	C								
13	D								
14	E								
15	F								

Fig. 1-17 Code Table of Block Graphics for STX-80

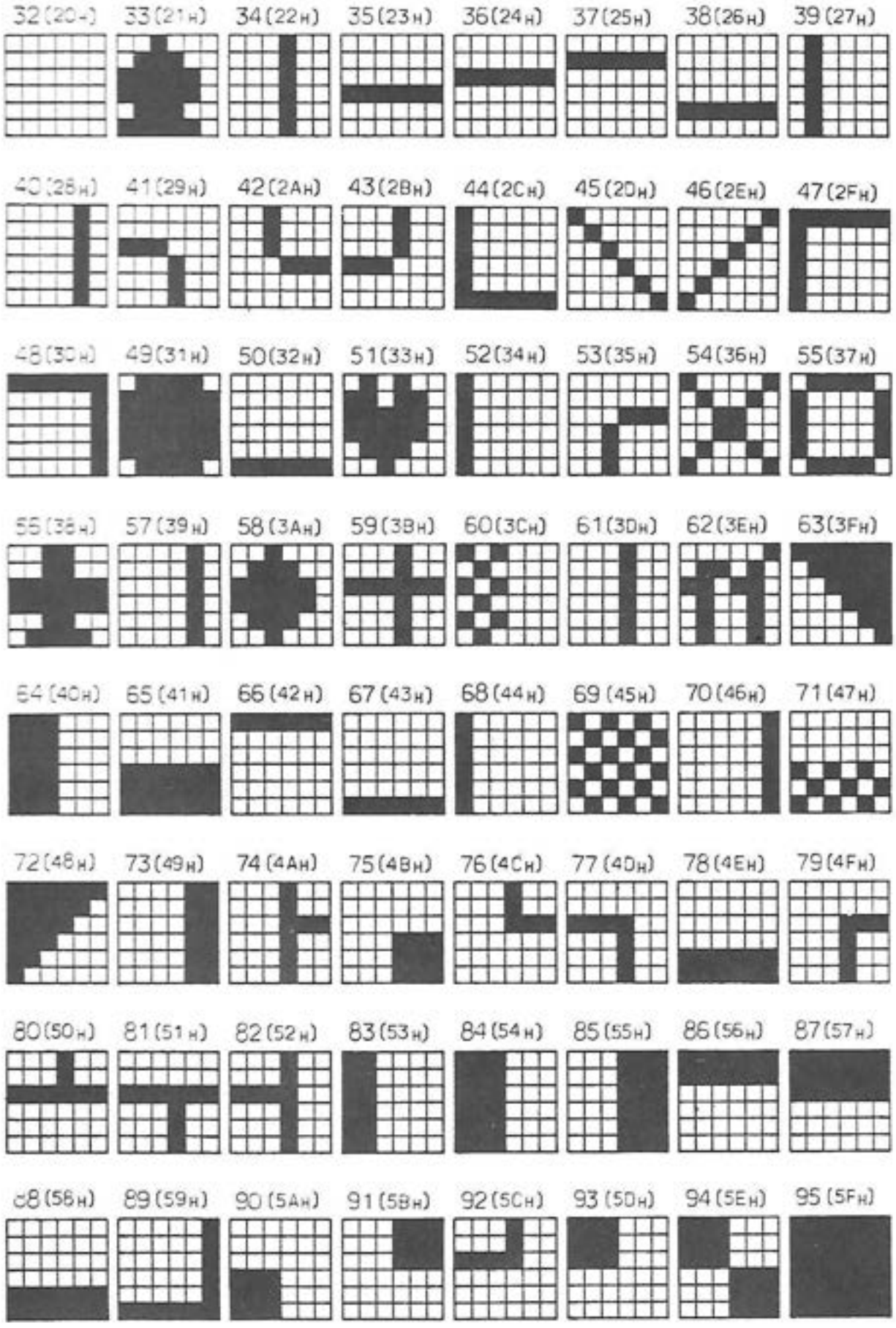


Fig. 1-18 Character Style Table of Block Graphics [STX-80 Type]

(2) STX-80T Type

Block graphic characters of STX-80T type are shown in Fig. 1-19. These characters can be printed by the control code "SI".

DEC		0	16	32	48	64	80	96	112
	HEX	0	1	2	3	4	5	6	7
0	0								
1	1								
2	2								
3	3								
4	4								
5	5								
6	6								
7	7								
8	8								
9	9								
10	A								
11	B								
12	C								
13	D								
14	E								
15	F								

Fig. 1-19 Code Table of Block Graphics for STX-80T

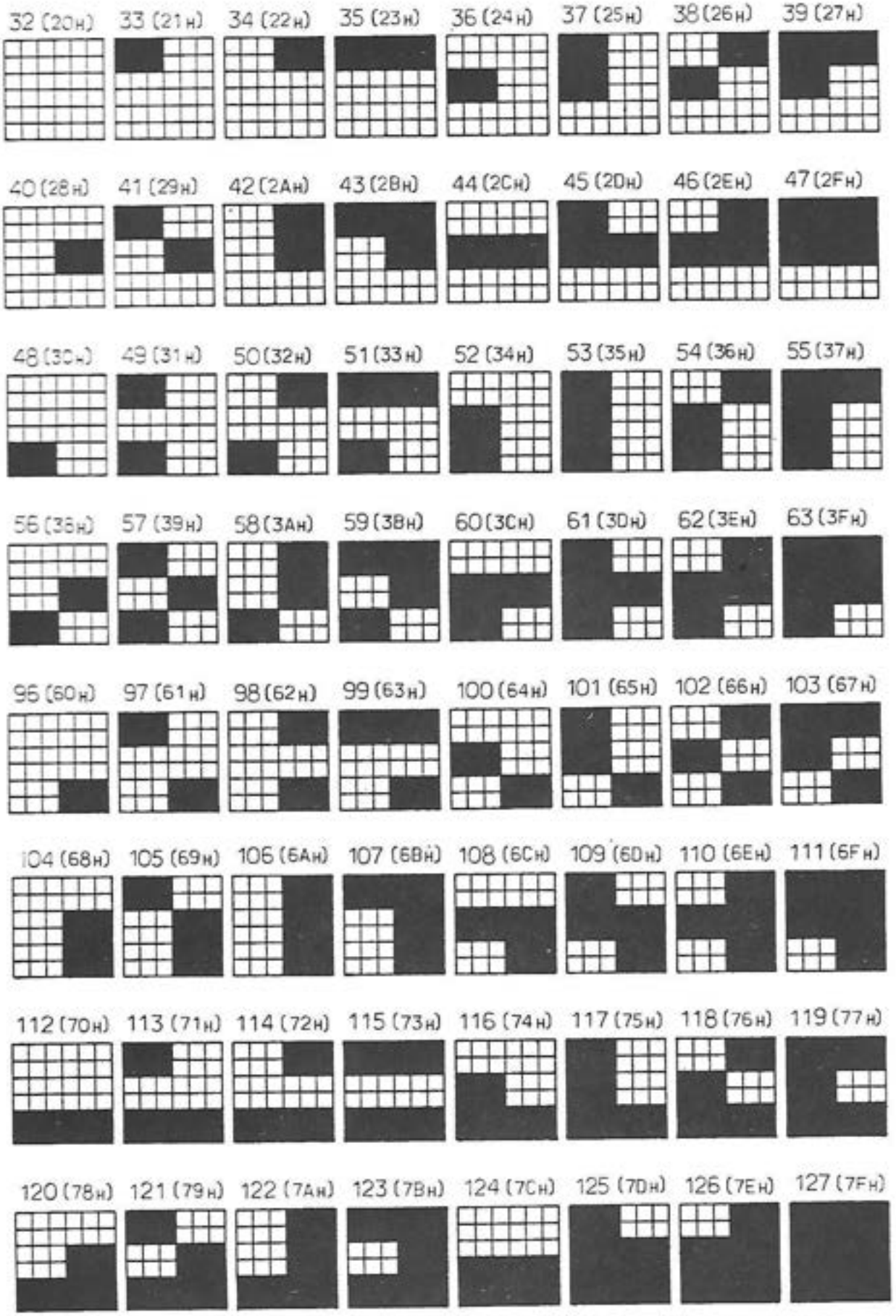


Fig. 1-20 Character Style Table of Block Graphics [STX-80T Type]

6. Control Codes

The following is a list of the control codes that are appliable to the STX-80/-80T printers and a description of each.

CONTROL CODES	(ASCII)

* Carriage Return — CR

Receipt of CR code causes the data stored in the memory buffer to be printed. When DIP switch 2 is set to "ON", one line feed is executed automatically, after a CR.

* Line Feed — LF

Upon receipt of LF code, the data stored in the memory buffer is printed, one line feed is executed.
If there is no data, only one line feed is executed.

* Form Feed — FF

When FF code is received and after the data stored in the memory buffer is printed, the paper is advanced to the header of the next page.

* Horizontal Tab — HT

When HT code is received, the print head is moved to the next preset horizontal tab position.
Default setting is performed at performed at every 10 columns.
This code can not be used in the Enlarged Printing Mode and/or Block Graphics Mode.

* Selection of Enlarged Printing Mode — SO

When SO code is selected, subsequent data is printed in enlarged mode. This function is cancelled by DC4 or CR code.

* Cancellation of Enlarged Printing Mode — DC4

When DC4 code is received, the enlarged printing mode set by "SO" is cancelled.

* Selection of Block Graphics — SI

When SI code is selected and after the data stored in memory buffer is printed, the block graphic character set is selected.

* Cancellation of Block Graphics — DC2

When DC2 code is received, printing mode is set to the standard ASCII character set and the block graphics data stored in the memory buffer is printed.

* Bit Image Graphics Mode — ESC K n_1 n_2

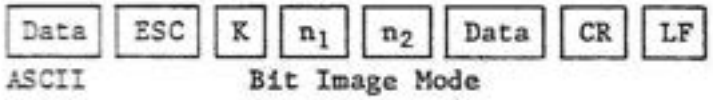
The printer is set to the Bit Image Graphics Mode by entering "ESC K" followed by n_1 and n_2 which determine the horizontal dot width.
For details, please refer to section 7 in this chapter.

* Selection of Line Spacing ESC A n

When ESC A 1 code, or ESC A 2 code is loaded, line spacing for text mode is set to 6-dot height, or 1/6 inch.
When ESC A 6 code, ESC A 7 code, ESC A 8 code is loaded, line spacing in bit image mode is set at 6-dot height, or 7-dot height, or 8-dot height. This code is only valid if the line ends in bit image mode(not text).
If the line spacing is not set by this code, the default setting is performed 1/6 inch in text mode, and 7-dot or 8-dot height in bit image mode according to the setting of DIP switch 3.

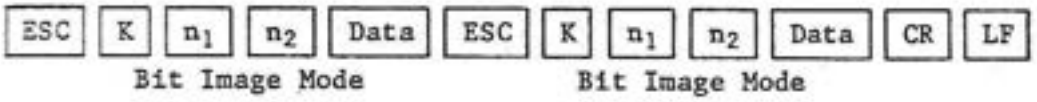
(NOTE)
When various modes are present in a line, the line spacing is determined by the data mode just before CR or LF, or by the data mode at the time of buffer-full status.

EXAMPLE 1

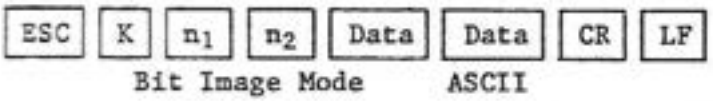


EXAMPLE 2

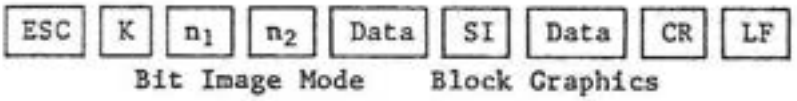
EXAMPLE 3



EXAMPLE 4



EXAMPLE 5



In example 1, 2 or 3, a line is fed by the number of dots set by ESC A n code (n=6, 7 or 8)

In example 4 or 5, a line is fed 6-dot height or 1/6 inch set by ESC A 1 code or ESC A 2 code.

7. Bit Image Mode

This printer has a graphics mode to create dot graphics on the printer.
Selecting bit image graphics mode is decided by Control code "K" which is set after the "ESC" code.
Then the number of bit image data is sent in decimal or hexadecimal numbers of n_1 and n_2.
n_1 is the remainder of (number of data) over 256, and n_2 is the quotient of (number of data) over 256.
For example, for 480 dot bit image printing, n_1 should be "224" in decimal or "E0" in hexadecimal and n_2 should be "1" in decimal or "01" in hexadecimal.

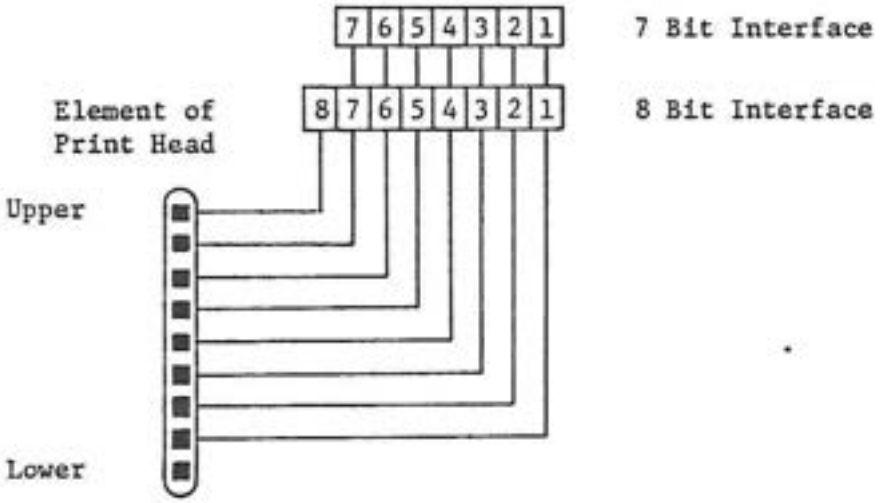


Fig. 1-21 Transmitting Method of Print Data

In bit image mode, the maximum number of dot positions printable per line is 480.
Therefore, values for n_1 and n_2 in excess of 480 dots positions are treated as text data and printing of bit image data after the 480th dot position is not guaranteed.
Mixing of text data and bit image data is possible on the same line.
After finishing bit image printing, the printer returns to the text mode.

Example 1.

Data A	ESC	K	n_1	n_2	Data B	Data C	CR	LF

Print example:

Data A (ASCII)	Data B (Bit Image)	Data C (ASCII)

Example 2.

Data A	SI	Data B	ESC	K	n_1	n_2	Data C	Data D	CR	LF

Print example:

Data A (ASCII)	Data B (Block Graphics)	Data C (Bit Image)	Data D (Block Graphics)

8. Printer Initialization

When the printer is turned off and then on again, the following events take place.

a) The print head returns to its home position.

b) The memory buffer is cleared.

c) Character pitch is set to 11 CPI.

d) Line spacing in text mode is set to 1/6 inch.

e) Line spacing in bit image mode is set to 7-dot or 8-dot height according to the DIP switch 3.

f) Standard ASCII character set is selected.

9. Self-Test Print Function

A Self Test print function is pre-programmed in this thermal printer. With this function the following tests are accomplished.

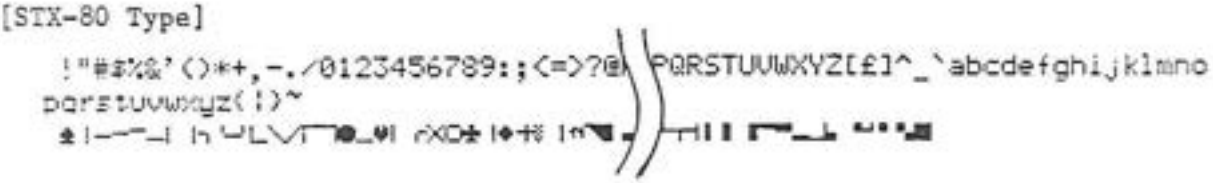
(1) Print head and print quality test

(2) Printer mechanism test

Test print function is envoked by the depression of LF switch while turning power on.

Caution: Do not operate printer without paper.

[STX-80 Type]



[STX-80T Type]

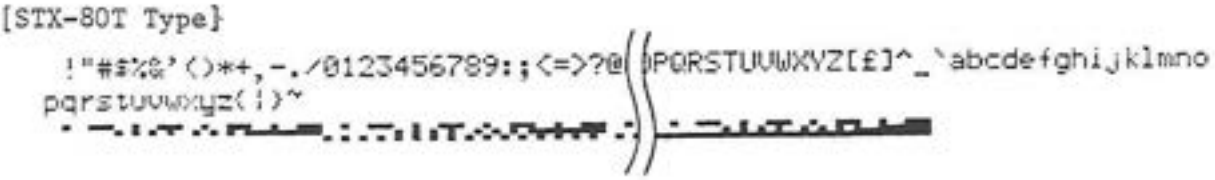


Fig. 1-22 Printout Sample of Self-Test Print

2. PRINTER INSTALLATION

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1. Location of the Installation

When you install this thermal printer the following points should be observed.

(1) Place the printer horizontally.

(2) Avoid places where the printer is exposed to direct sunshine or close to a heater, or heat generating applicances.

(3) Do not operate the printer under circumstances of extreme high or low temperature, or of strong vibration.

(4) Do not operate the printer in a place of high humidity or a dusty place with oil or iron particles.

(5) Provide a separate power supply away from applicances or noise generating motors.

(6) Power supply voltage must be the same voltage as specified on the identification plate.
Extreme high or low voltage may cause printer problems.

********** C A U T I O N **********

If printer is not under control (night-time, holidays, etc.), please pull out the power plug from the power receptacle.

2. Inserting Paper

(1) Make a straight cut on the leading edge of the roll paper. Use care about the heat-sensitive surface and paper bending while inserting the paper into the inlet. Rotate the platen knob.

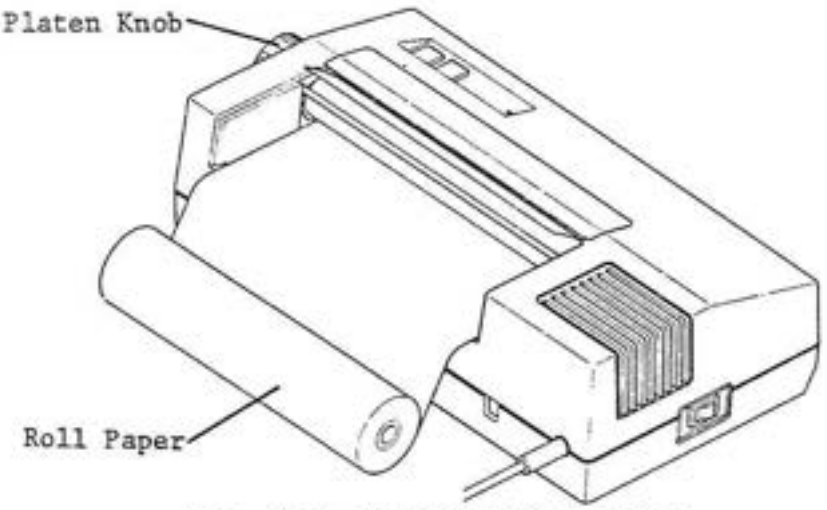

Fig. 2-1 Roll Paper Inserting

(2) Wind the roll paper tight removing any looseness in the roll, then set the roll in its holder.

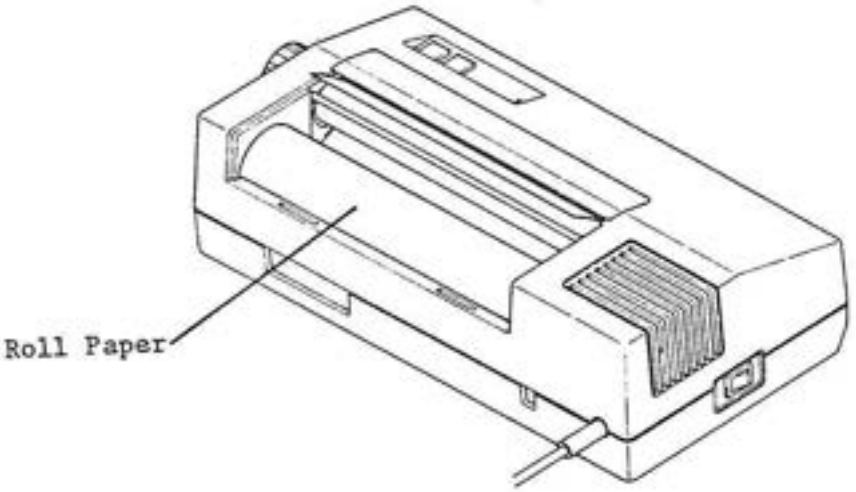

Fig. 2-2 Roll Paper Setting

(NOTE) Make sure power to the printer is off so as not to damage the paper advance gears.

3. Precautions of Operation

(1) When hand-shaking with $\overline{ACK}$ signal, turn on the power to the host device first, and then turn on the power to the printer.
(2) During printing, never touch the print head.
(3) Don't try to print without paper.

4. Maintenance

4-1 Cleaning

In order to maintain optimum performance over the life of this thermal printer, it is necessary to perform periodic cleanings.

(1) Remove dirt and dust from the case and cover of the printer by using a soft cloth with alcohol.

(2) Remove dust and small particles from the printer mechanism and PCB by means of a soft brush or the like.

(NOTE) Be careful so as not to moisten the electronic parts and/or mechanism.

4-2 Periodical Inspections

In order to obtain maximum performance, it is necessary to inspect the printer periodically (every three month or every 300 thousand lines).

	Parts to be inspected	Methods
1.	Cleaning of detector peripherals	Clear with a soft brush.
2.	Movement of each mechanism	Place the printer in self-test, and check the movement of each assembly for existence of abnormal sound.
3.	Looseness of each screw	Check and tighten as required.
4.	Damage of platen	Revolve the platen and check for any damage.

3. THEORY OF OPERATION

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1-2 Print Head Movements 37

1-3 Timing Signals 37

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1. Printer Mechanism

The printer mechanism consists of the following parts:

(1) The print head composed of 9 print elements.

(2) The carriage assembly which holds the print head in place and moves it either to the left or to the right.

(3) The paper feed mechanism which secures the paper when not in use and intermittently feeds the paper.

(4) The timing signal generating mechanism which is used by the printer's timing circuitry.

(5) The main print control unit.
The print head and the paper feed are powered by stepper motors.

1-1 Print Head

The print head is composed a thermal elements. Each of the thermal elements are individually activated by print signals coming from the control circuitry. Each individual thermal dot is energized on command and transferred to heat sensitive paper.

1-2 Print Head Movements

The revolutions of the stepper motor are transferred to the carriage assembly by means of a wire rope.

1-3 Timing Signals

When the motor begins revolving, it is set in motion in the positive direction. A sine wave is generated from the timing plate. As soon as the print head moves away form its "home position", the timing detector turns on and the "beginning to print" signals are generated. As the print head moves to the right, the timing signal is generated in time with the sine wave mentioned above. This is the standard timing condition.

1-4 Paper Feed

The paper feed motor is activated by 13 volt pulses from the control logic board. These pulses are sent in time with the sine wave timing signal mentioned in 1-3. The platen assembly is driven by means of a gear at the end of the platen shaft. This gear is meshed with the drive gear on the paper feed motor.

2. Control Circuit

Fig. 3-1 shows the block diagram of the printer control circuit.

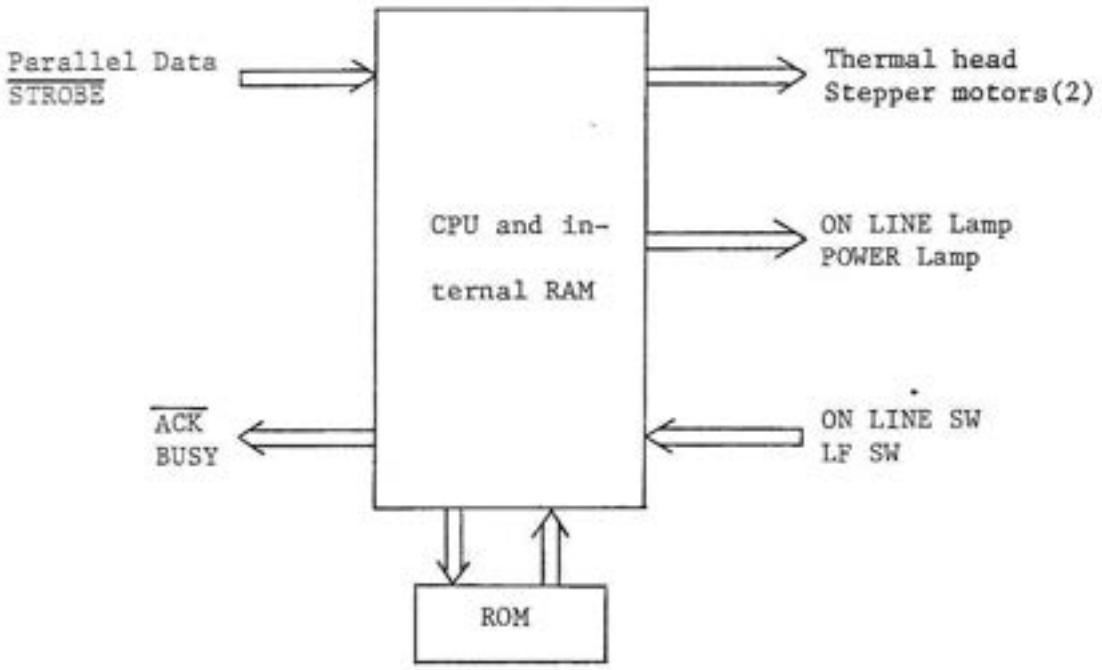


Fig. 3-1 Control Circuit Block Diagram

2-1 Description of the Main Device Functions

Functions of the main devices on the control logic board are outlined as follows:

(1) CPU (μPD 7800)

The CPU is mounted in IC 1 on the control logic board.
This IC is an 8-bit microprocessor operating at a rate of 2.5μs per instruction with an external 4 MHz quartz crystal circuit.

(2) ROM (μPD 2732)

The ROM is mounted in IC8 on the control logic board.
Its 2K bytes area is used for character generation and the other 2K bytes is for program area.

2-2 Print Control

Data is latched from AB0 - AB8 (pin 49∿57) of IC 1 into IC 9 and IC 10 and held until the first time pulse from PA7 of IC 1.

1st Time Pulse: Data is transferred to driver TRA1 and TRA2.

2nd Time Pulse: TRA1 and TRA2 are activated for half the time base of IC 15 (300ms) thus turning on the appropriate head elements.

3rd Time Pulse: TRA1 and TRA2 are turned off.

During the time that TRA1 and TRA2 are on, VH (11∿14V) is applied to each selected head element.

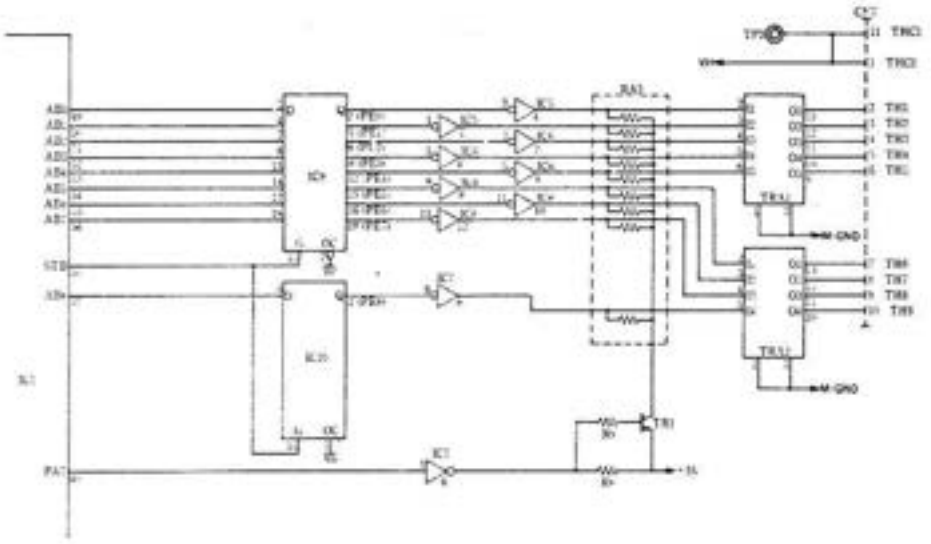


Fig. 3-2 Example of Printing Control

2-3 Motor Control

(1) The paper feed motor is controlled by PA0, PA1 + PA2 of IC 1 and TRA3. The output of TRA3 (pins 2, 7, 10, 15) is used to activate the four (4) phases of the paper feed motor.

(2) Carriage motor activity is controlled by PA3, PA4 + PA5 of IC 1 and TRA4. Pins 2, 7, 10, 15 of TRA4 are used to activated the four (4) phases of the carriage motor.

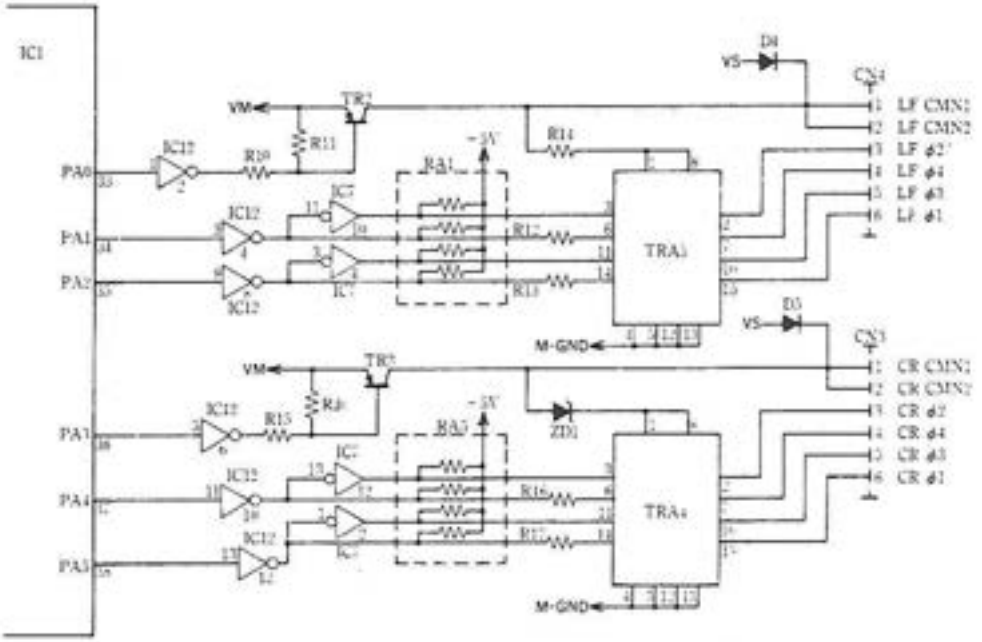


Fig. 3-3 Example of Motor Control Circuit

2-4 Parallel Interface

Parallel data (DATA 1 ∿ DATA 8) and the $\overline{\text{STROBE}}$ pulse are input to the interface connector (CN1).

When the parallel data has been processed, $\overline{\text{ACK}}$ and BUSY respectively are output.

Fig. 3-4 shows an example of Parallel Interface.

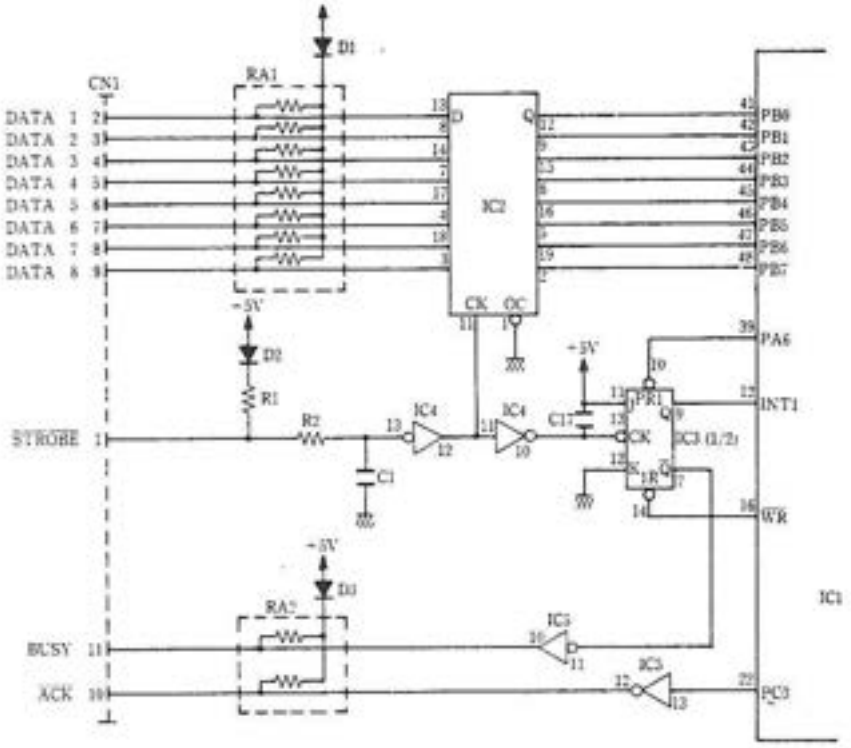


Fig. 3-4 Example of Parallel Interface

3. Power Supply Circuit

The power supply converts the AC Input source into the following DC Voltage:

a) Vcc (+5V): for the CPU's ROM and all other supporting IC's.

b) VM (+13V): is used to drive the two stepper motors.

c) VS (+3V) : used as a position holding voltage for both stepper motors.

d) VH (+11V~+14V): supplies power to the thermal head.

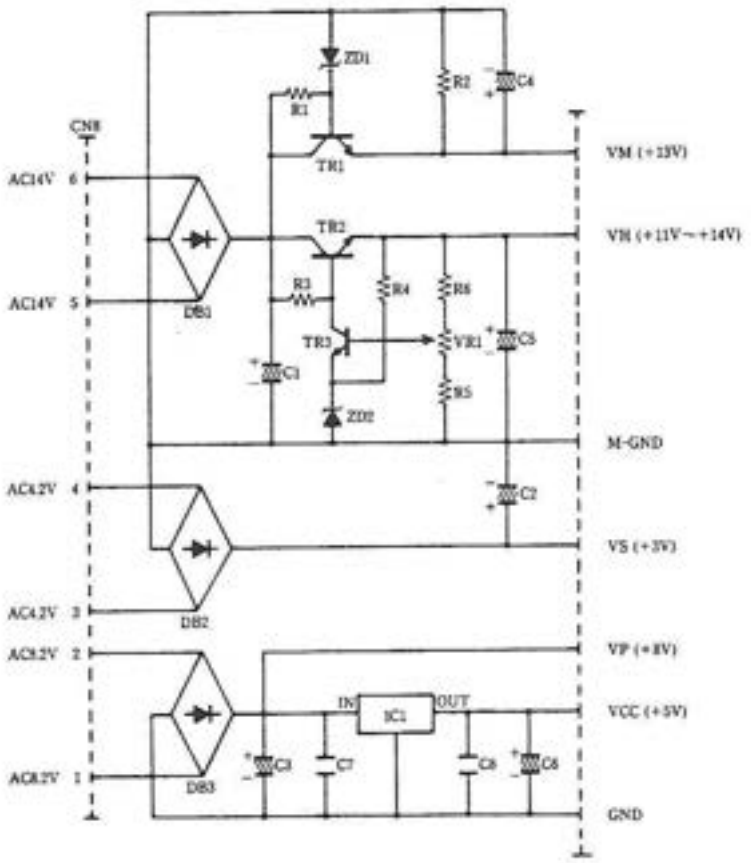


Fig. 3-5 Circuit Example of Power Supply

4. ADJUSTMENTS

1. Voltage Adjustment of
the Thermal Print Head Power Supply (VH) 47

2. Pulse Signal Timing Adjustment 49

3. Timer Adjustment 51

1. Voltage Adjustment of the Thermal Print Head Power Supply (VH)

Thermal print heads are classified into three head ranks, A, B, and C, according to voltage specifications.

Head Rank	VH(+11V ∿ +14V)
A	+13.8V
B	+13.3V
C	+12.7V

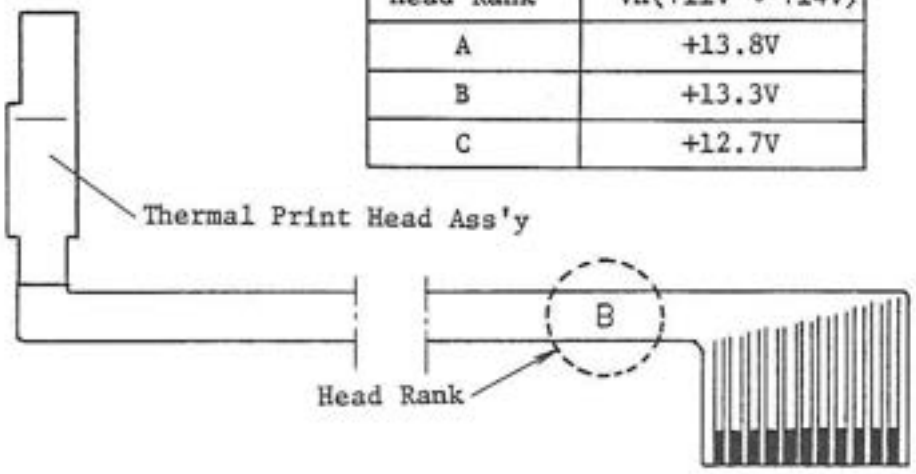


Fig. 4-1 Head rank indication

Whenever the thermal print head or power regulator board is replaced, be sure to adjust the voltage of the thermal print head power supply to the specifications of the thermal print head being used.

Method of adjustment:

(1) Turn the printer off and turn (VR1) of the power regulator board clockwise as far as it will go. (See Fig. 4-2)

(2) Turn the printer on.

(3) Measure the voltage across Pin 2 (M-GND) and Pin 3 of the CN2 on the control logic board, and adjust the voltage to the head supply voltage (VH) specified for the head rank by turning (VR1) slowly counterclockwise.

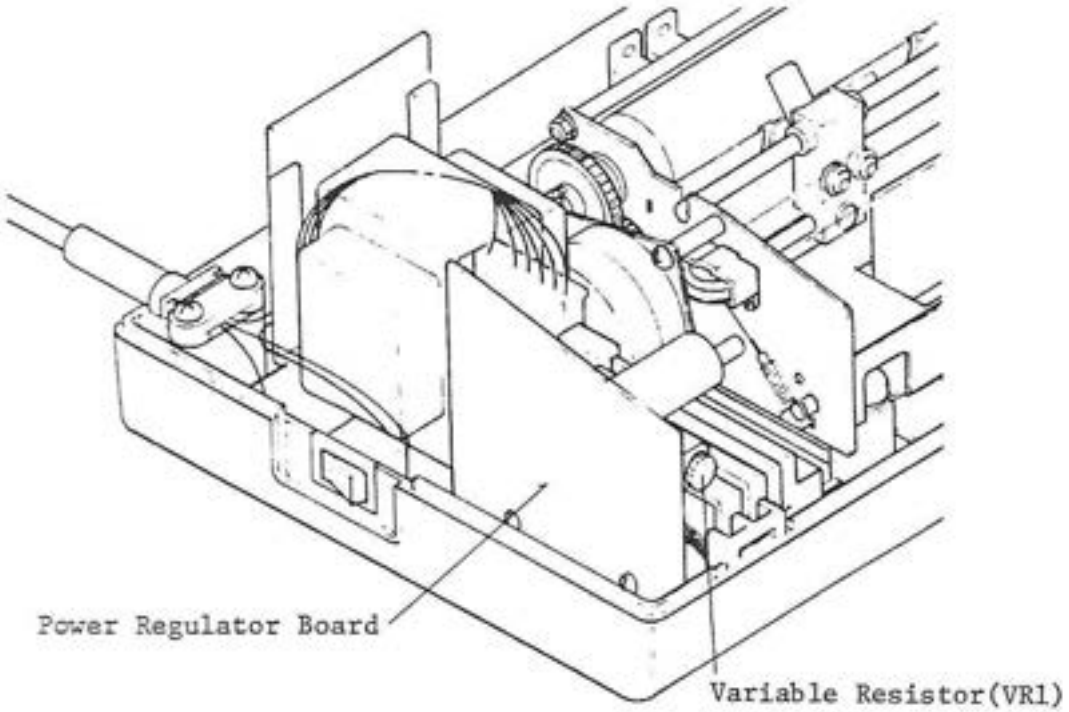


Fig. 4-2 Variable Resistor

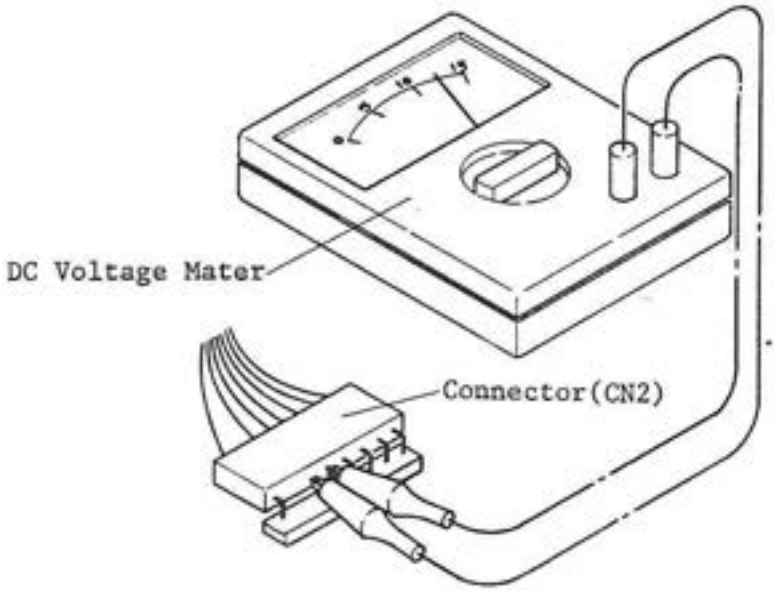


Fig. 4-3 Measurement of the Print Head Supply Voltage (VH)

2. Pulse Signal Timing Adjustment

Pulse signals include timing pulse signal and home position pulse signal which are adjusted using an oscilloscope as follows.

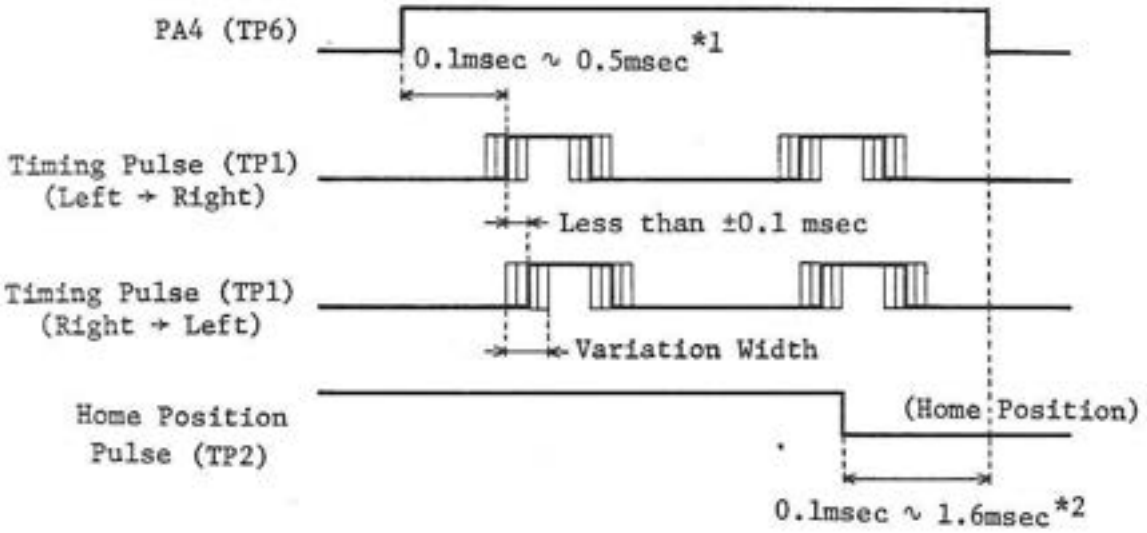
(1) Adjusting the timing pulse signal

Measure the carriage motor drive pulse signal PA4 (TP6) and the timing pulse signal (TP1). Adjust the pulse timing signal as shown in the timing chart of Fig. 4-4, by loosining the timing detector board mounting screws (M3 × 4) and moving the board right or left. (See Fig. 4-5)

(2) Adjusting the home position pulse signal

After adjusting the timing pulse signal, measure the timing signal (TP1) and the home position pulse signal (TP2) and adjust the timing pulse signal shown in the timing chart of Fig. 4-4, by loosening the home position detector board mounting screws (M3 × 6) and moving the board right or left. (See Fig. 4-5)

(Note) After adjusting, apply a small quantity of screw lock to the mounting screw heads.



(Note)

*1 From the rising or falling edge of PA4 to the rising edge (mid-point of variation width) of a timing pulse (left to right or right to left, whichever nearer to the rising edge of PA4).

*2 From the falling edge of home position pulse to the rising or falling edge of PA4.

Fig. 4-4 Timing Chart

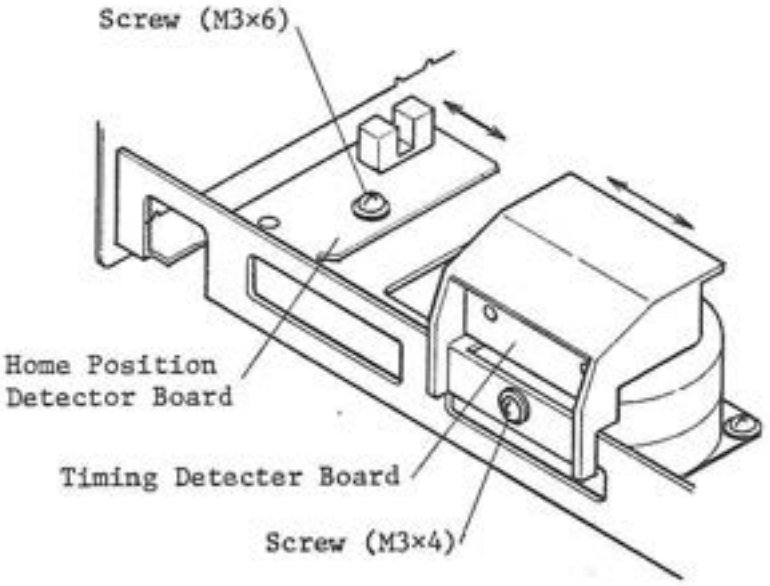


Fig. 4-5 Adjustments of the Pulse Signal

3. Timer Adjustment

Energizing time of the thermal print head is determined by the timer in the control logic board.

The timer is adjusted as follows:

Observe the waveform at test point 4 (TP4) using an oscilloscope, and adjust the (VR1) on the control logic board so that the pulse width has the value shown below.

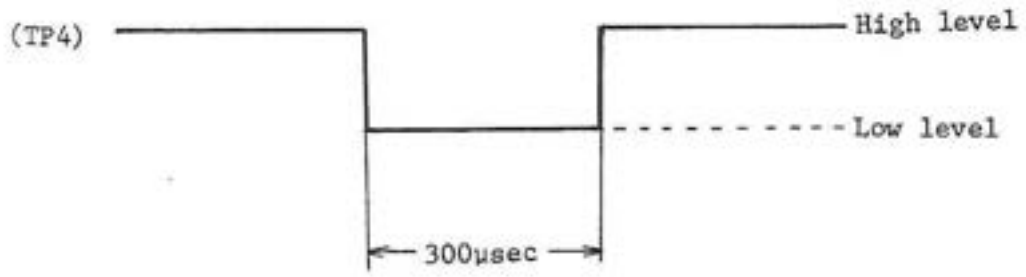


Fig. 4-6 Pulse Width of the Timer

(Note)

When adjusting (VR1), use a plastic screwdriver or a screwdriver with an electrically insulated grip.

5. PARTS REPLACEMENT

1. Replacement of Upper Case ····· 55
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11. Replacement of Platen Assembly ····· 71
12. Replacement of Detector Board ····· 73

1. Replacement of Upper Case

(1) Remove the cover from the printer by lifting the back portion of the cover.

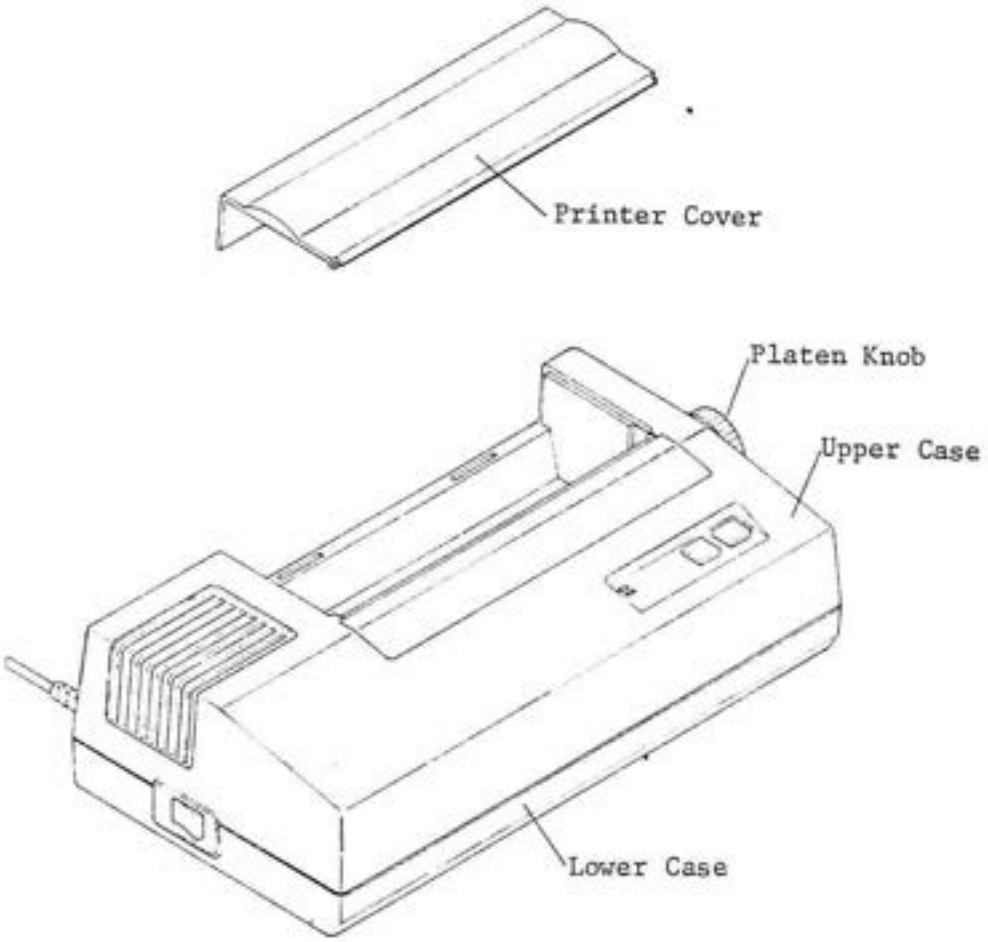


Fig. 5-1 Removal of cover

(2) Remove the platen knob by the pulling it straight out.

(3) Remove the two case mounting screws (M4 × 8) located on both ends of the paper tray.

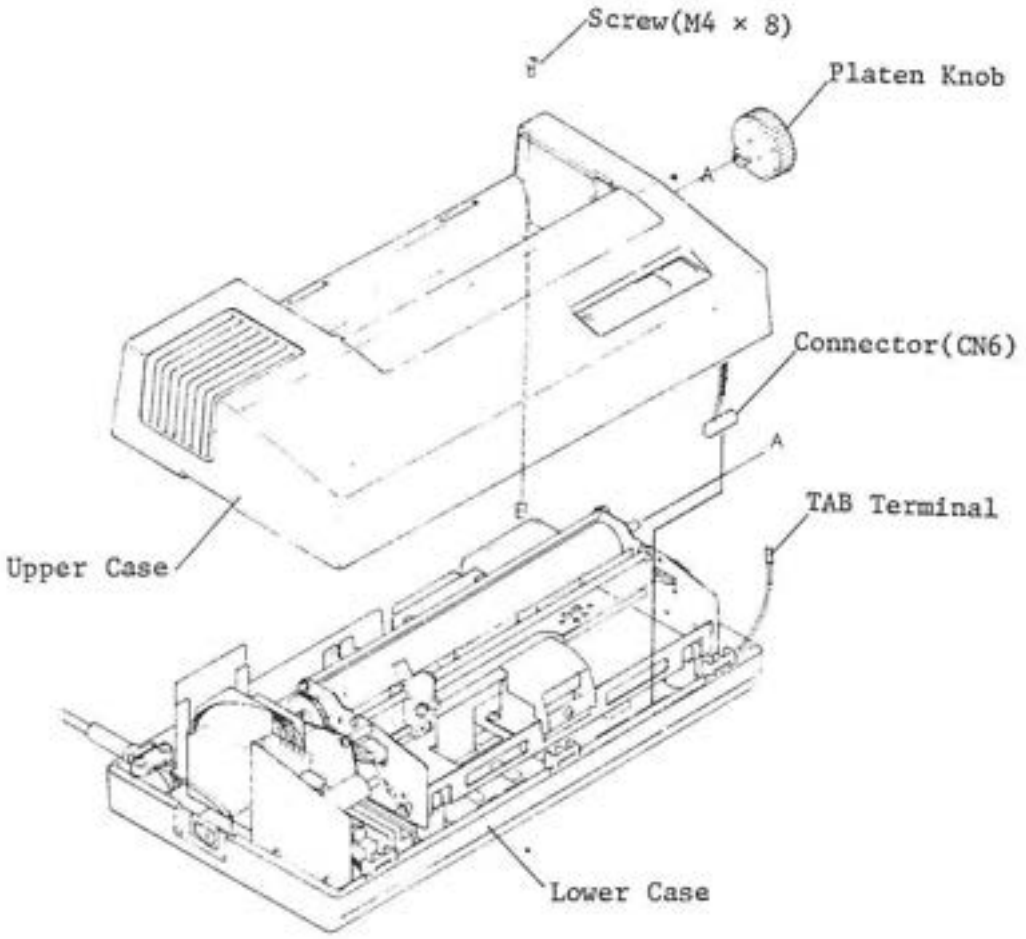


Fig. 5-2 Removal of Upper Case

(4) Lift upper case slightly. Disconnect connector (CN6) and TAB terminal that connects the control panel to the control panel board unit, and the ground wire form the power supply.

2. Replacement of Control Panel Board Unit

(1) Remove upper case as described in item 1.

(2) Remove 2 tapping screws (M3 × 8) holding control panel board unit.

(3) Install a new control panel board unit by reversing preceeding steps. Apply screw lock to the screw heads.

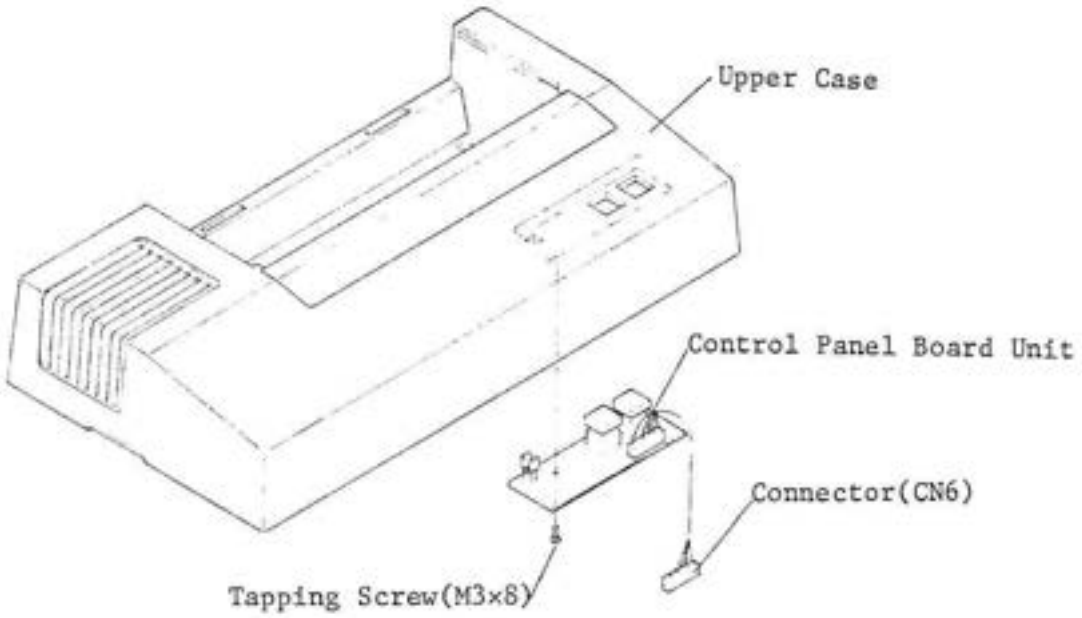


Fig. 5-3 Replacement of Control Panel Board Unit

3. Replacement of Printer Mechanism

(1) Remove upper case by the procedure described in item 1.

(2) Disconnect connector (CN7) to the control logic board.

(3) Remove mounting screw (M3 × 6) that hold shield plate.

(4) Remove mounting screws (M4 × 14 × 4) that hold Printer mechanism.

(5) Disconnect the connector's (CN3 ∿ CN5) and TAB terminal to the control logic board.

(6) Lift up the printer mechanism and remove it.
Take care not to lose rubber feet and collars.

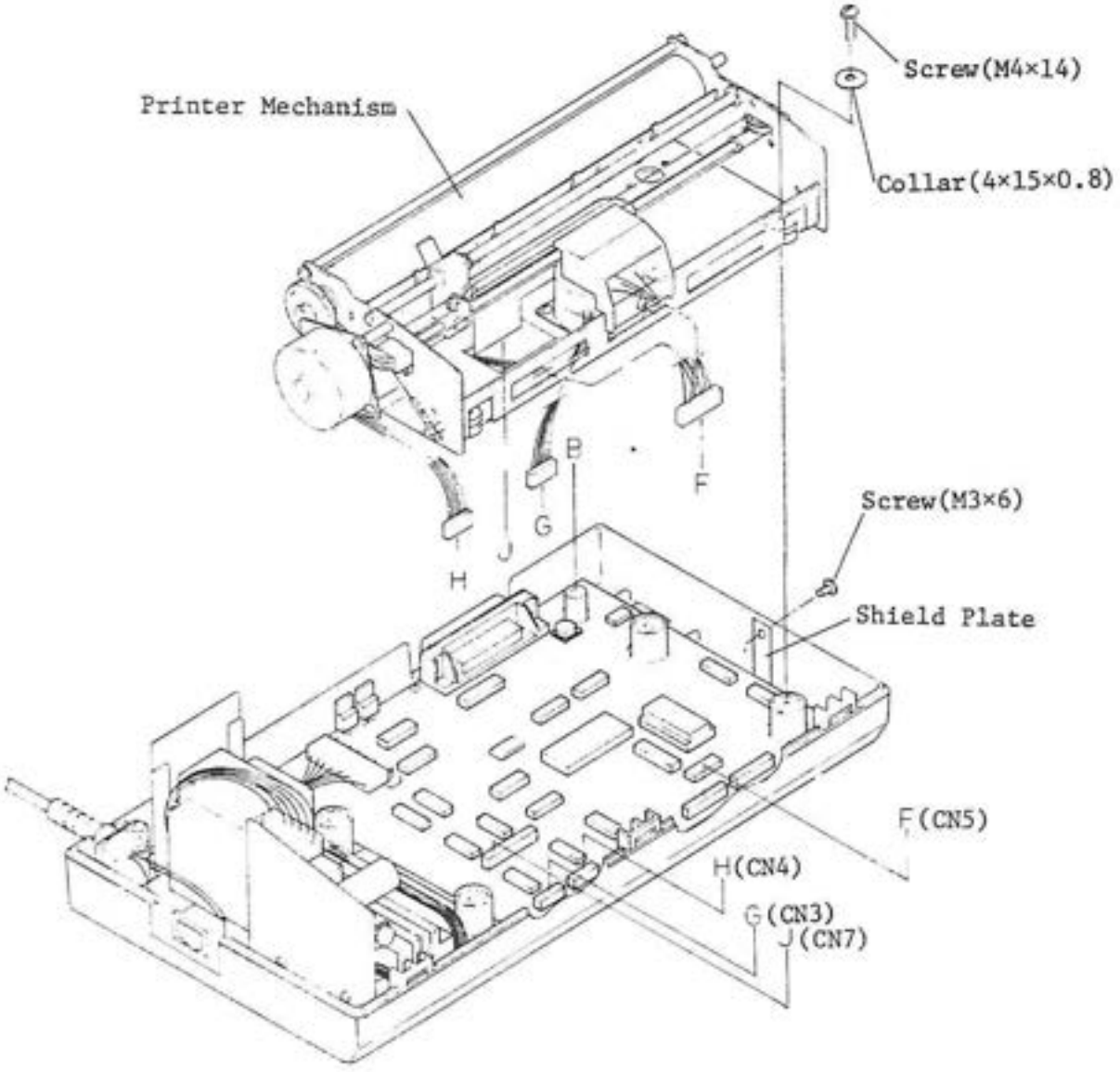


Fig. 5-4 Removal of Printer Mechanism

(7) Install the printer mechanism by reversing the preceeding steps. Clamping torque for the mounting screws (M4 × 14 × 4) of the printer mechanism should be 3.9 Kg-cm.

(8) Fix the shield plate to the printer mechanism with the mounting screws (M3 × 6).

(9) Apply screw lock to all screw heads.

(10) Firmly engage connectors from the printer mechanism to the control logic board.

4. Replacement of the Control Logic Board

(1) Remove upper case by the procedure described in item 1.

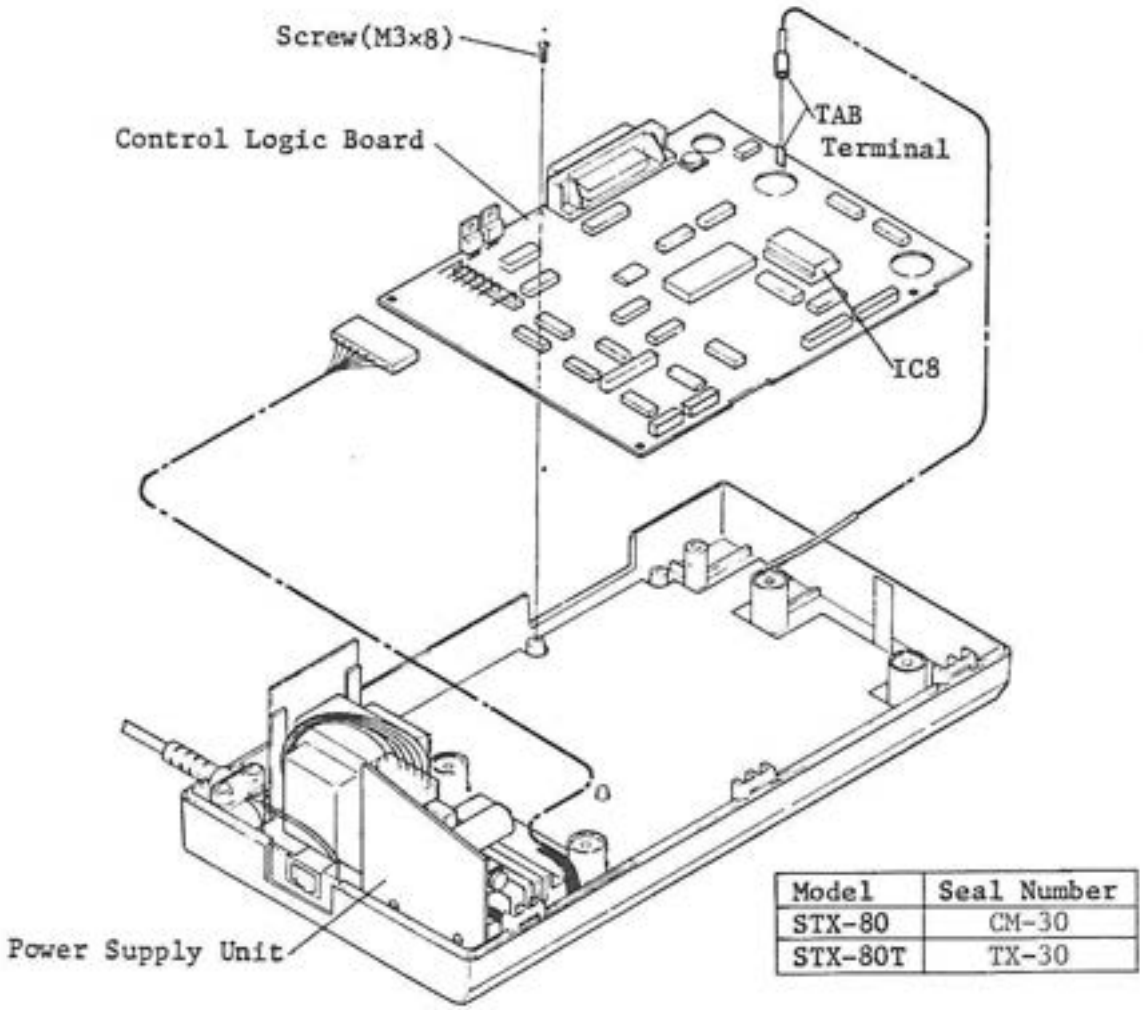
(2) Remove printer mechanism by the procedure described in item 3.

(3) Disconnect connector (CN2) from the power regulator board.

(4) Disconnect TAB terminal from the shield plate.

(5) Remove screws (M3 × 8 × 5) fastening the control logic board.

(6) Install a new control logic board by reversing the proceding steps and apply screw lock to the screw heads.



Model	Seal Number
STX-80	CM-30
STX-80T	TX-30

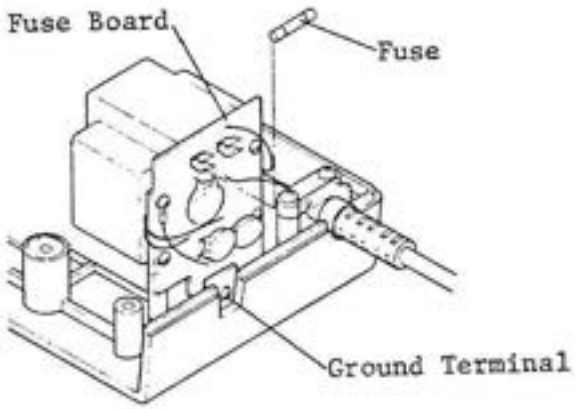
Fig. 5-5 Replacement of the Control Logic Board

(Note) When you change a control logic board, please be sure to refer the number sealed on IC8. New board should have the same number as the one that the former board has.

5. Replacement of Fuse

(1) Remove upper case by the procedure described in item 1.

(2) Replace fuse using only a slow-blow type fuse according to the following table.



AC Power	Fuse Type
120V	600mA/250V
220V	315mA/250V
240V	315mA/250V

Fig. 5-6 Replacement of Fuse

6. Replacement of Power Supply Unit

(1) Remove upper case as described in item 1.

(2) Disconnect connector (CN2) to the control logic board.

(3) Remove screws (M4 × 8 × 6) fastening power supply unit, shield plate and ground wire.

(4) Remove screws (M4 × 12 × 2) fastening power code clamp.

(5) Position a new power supply unit, shield plate and ground wire, and secure it with screws (M4 × 8 × 6).

(6) Reinstall the cord clamp and reconnect connector (CN2) to the power regulator board.

(7) Apply screw lock to each screw head.

(8) After replacing the power supply unit, check the thermal print head rank and adjust the supply voltage (VH) accordingly.
(See Paragraph 1 of 4. Adjustments)

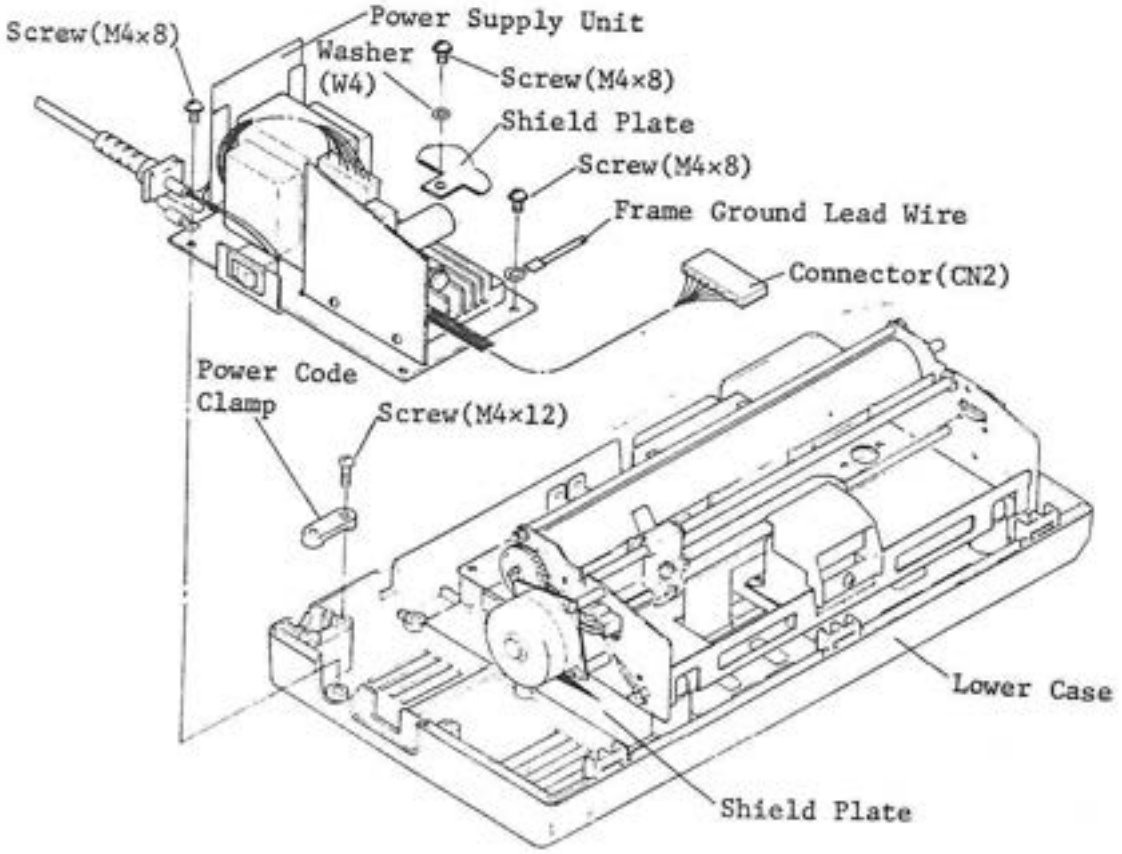


Fig. 5-7 Replacement of Power Supply Unit

7. Replacement of Thermal Print Head Assembly

(1) Insert paper and position thermal print head approx. 5cm from the right end.

(2) Disconnect ribbon cable from print head to the control logic board (connector CN7).

(3) Remove the mounting screw (M2 × 12) from print head.

(4) Press lightly at base of carriage, and incline the thermal print head slightly and remove by pulling it up, and replace with a new thermal print head assembly (See Fig. 5-8)

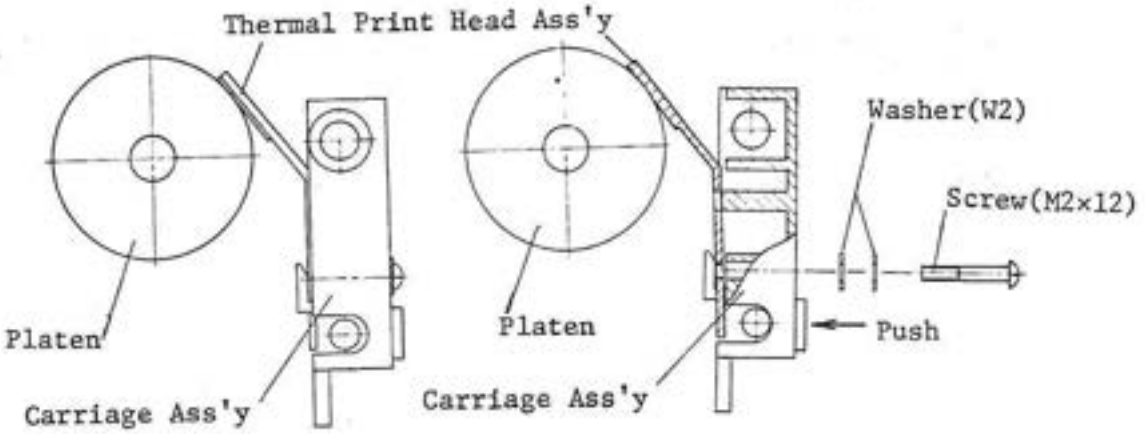


Fig. 5-8 Removing the thermal print head

(5) Connect the ribbon cable of the new thermal print head to the control logic board, connector (CN7).

(6) After replacing thermal print head, check the head rank and adjust the supply voltage (VH) accordingly. (See Paragraph 1 of 4. Adjustments)

(Note 1) Be sure to use the specified mounting screws (M2 × 12) to mount the thermal print head.

(Note 2) Do not move the thermal print head without paper inserted.

(Note 3) Do not touch thermal print head surface.

8. Replacement of Wire Rope

(1) Remove printer mechanism, as described in item 3.

(2) Remove thermal print head. (See Paragraph 7)

(3) Remove timing detector board. (See Paragraph 12)

(4) Remove paper feed motor. (See Paragraph 9)

(5) Pass the drive wire rope end (side not connected with spring) through hole (L) of the pulley Support (L) and frame (L) hole.

(6) Route the drive wire rope upward between the print head pulley (L) and the print head pulley (R) located on the carriage assembly.

(7) Pass the wire rope back through the holes of frame (L) and pulley support (L) and place the wire rope on the pulley.

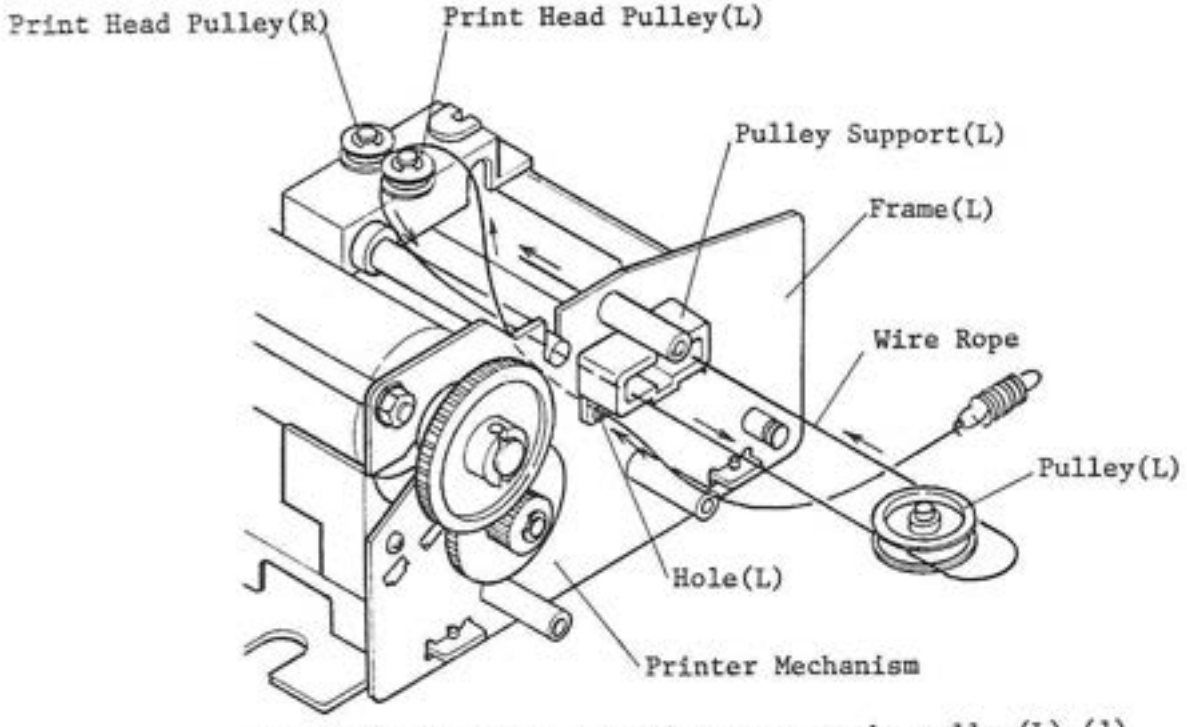


Fig. 5-9 How to put the wire rope on the pulley(L) (1)

(8) While pulling on the drive wire rope, place the pulley (L) into the pulley support (L), move the carriage to the left end, hook the spring on the spring shaft, and adjust the tension of the drive wire rope so that the spring is stretched as shown in Fig. 5-10.

(Note) When pulling the drive wire rope, press lightly on the bottom of the carriage so that the carriage does not hit against the photosensor on the home position detector board.

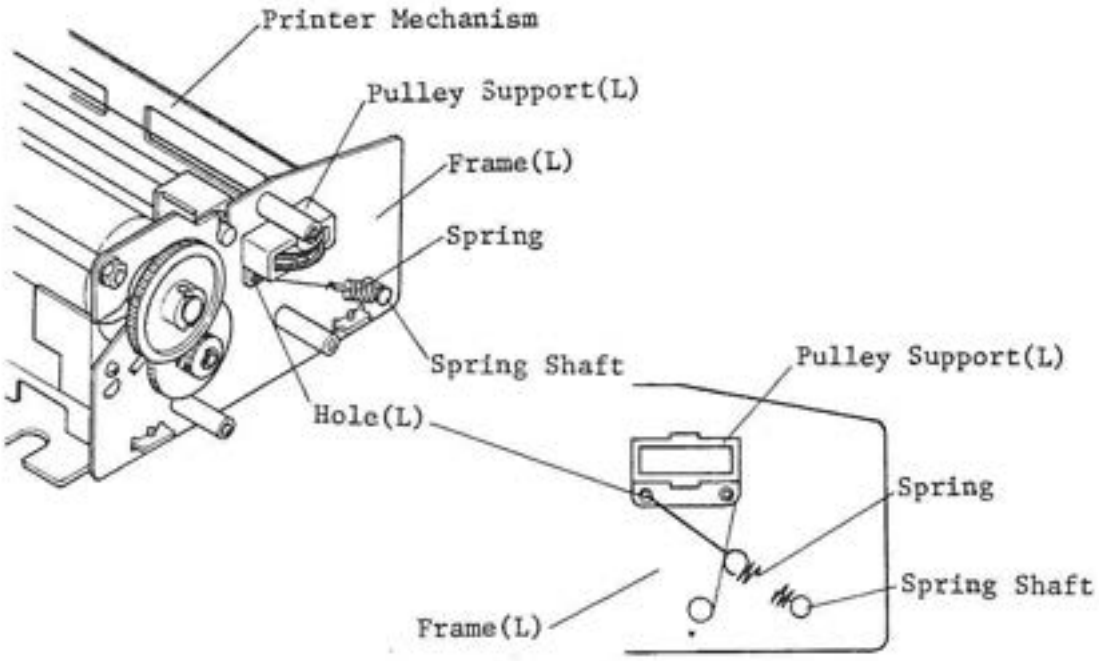


Fig. 5-10 How to put the wire rope on the pulley (L) (2)

(9) Position the notch of the drive pulley as shown in Fig. 5-11, wind the wire rope evenly 12 turns clockwise round the pulley upward from the bottom, secure with clip.

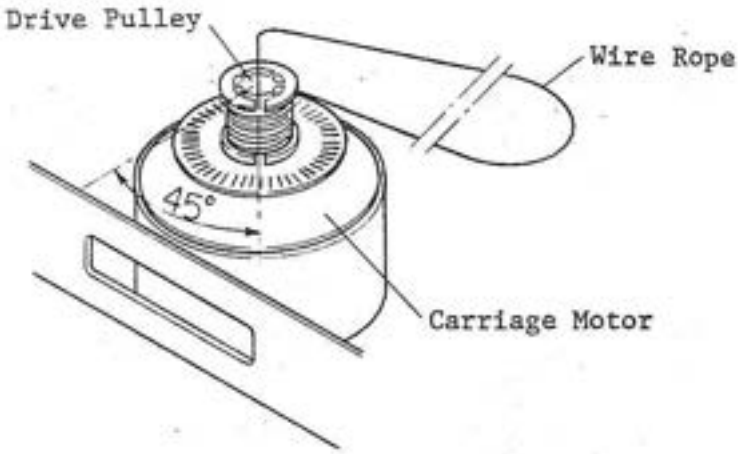


Fig. 5-11 How to put the wire rope on the drive pulley (1)

(10) Remove the clip and, preventing the drive wire rope from loosening, pass the drive rope end through the upper hole (1) and out the lower hole (2) of the drive pulley.

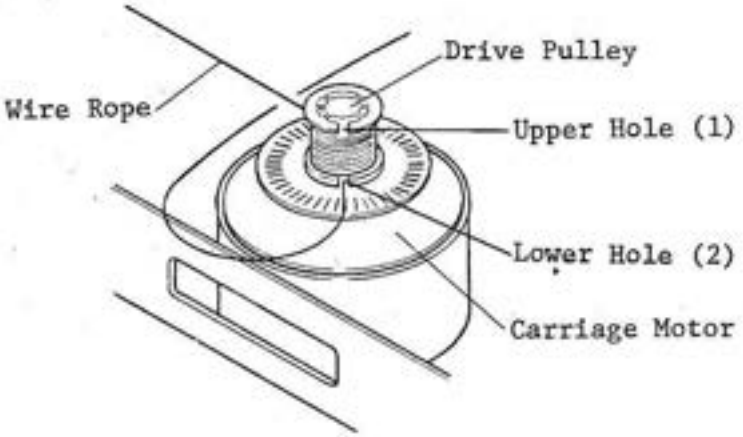


Fig. 5-12 How to put the wire rope on the drive pulley (2)

(11) Wind the wire rope clockwise round the bottom of the pulley and secure the wire with a clip.

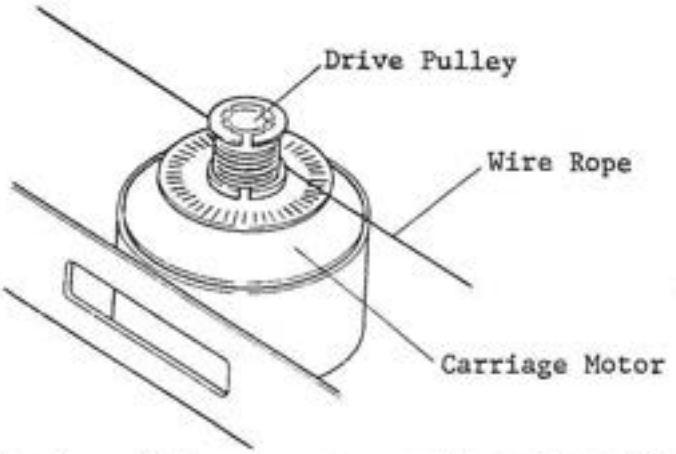


Fig. 5-13 How to put the wire rope on the drive pulley (3)

(12) Make the drive wire rope round, pass it through the holes of the frame (R) and the pulley Support(R), and put the wire on the pulley (R).

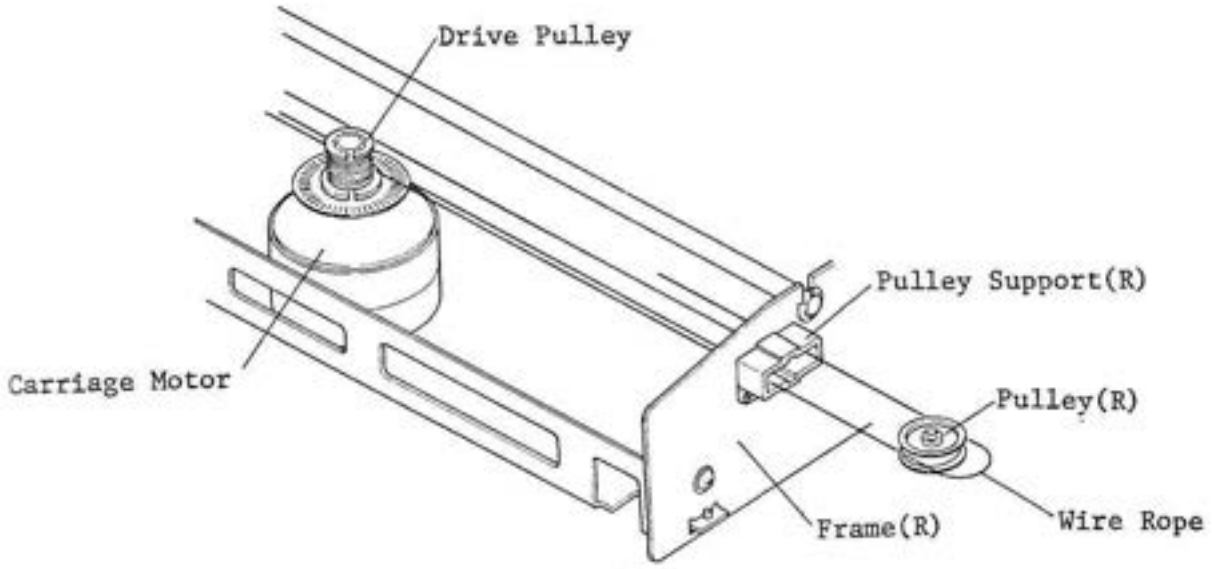


Fig. 5-14 How to put the wire rope on the pulley(R)

(13) Pulling the drive wire rope, put the pulley (R) in the pulley holder (R), and pass the drive wire rope end downward between the print head pulleys (R) and (L).

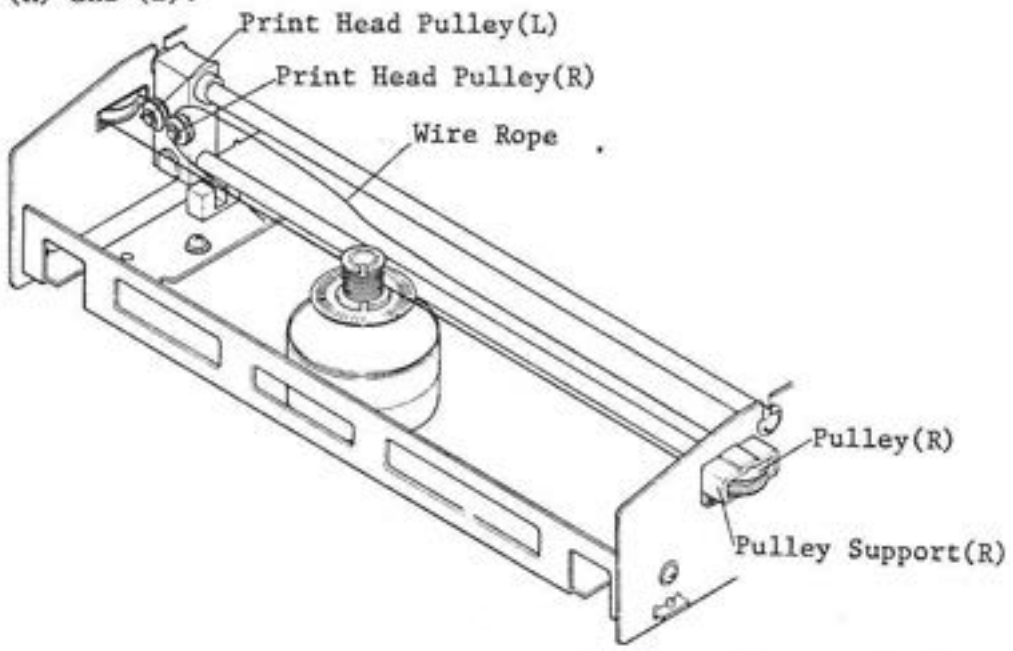


Fig. 5-15 How to put the wire rope on the Print head Pulley(R)

(14) Pass the drive wire rope through the holes of the pulley support(R) and frame (R) and then remove the clip securing the wire.

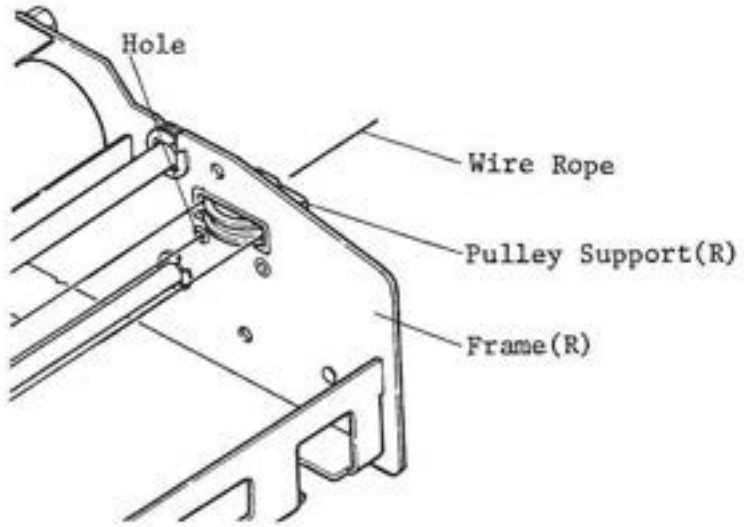


Fig. 5-16 How to pass the wire rope

(15) Pull the drive wire rope, adjust the spring tension as shown in Fig. 5-10 and fix the wire rope with the screw.

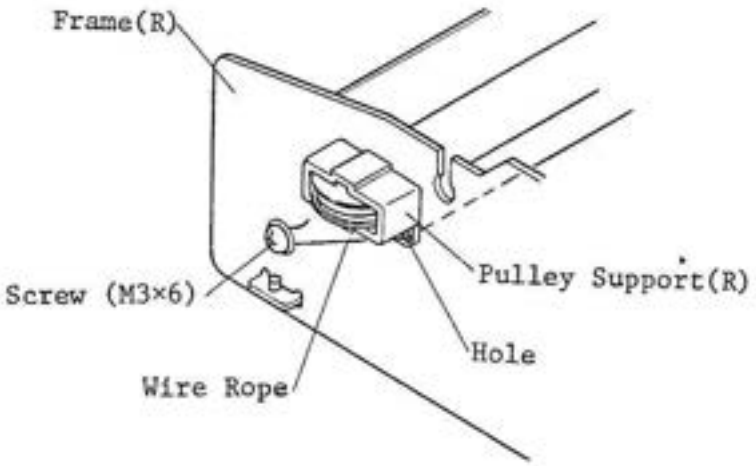


Fig. 5-17 How to fix the wire rope

(16) Move the carriage from the left end to the right end. If it cannot be moved up to both ends, recheck the number of wire turns and rewind the wire if necessary. (Refer to (9) and after)

(17) Replace the paper feed motor, timing detector board and thermal print head.

(18) With printing paper inserted, adjust the timing of the timing pulse signal and home position pulse signal. (See Paragraph 2 of 4. Adjustments)

(19) Apply screw lock to the screw heads.

(Note) When routing the drive wire rope, use care not to make kinks in the wire rope.

9. Replacement of Paper Feed Motor Assembly

(1) Remove printer mechanism as described in item 3.

(2) Remove TIE wrap holding lead wires to the paper feed motor.

(3) Remove screws (M3 × 6 × 3) fastening motor, and replace paper feed motor assembly.

(4) Reverse the preceeding steps. Apply screw lock to the screw heads.

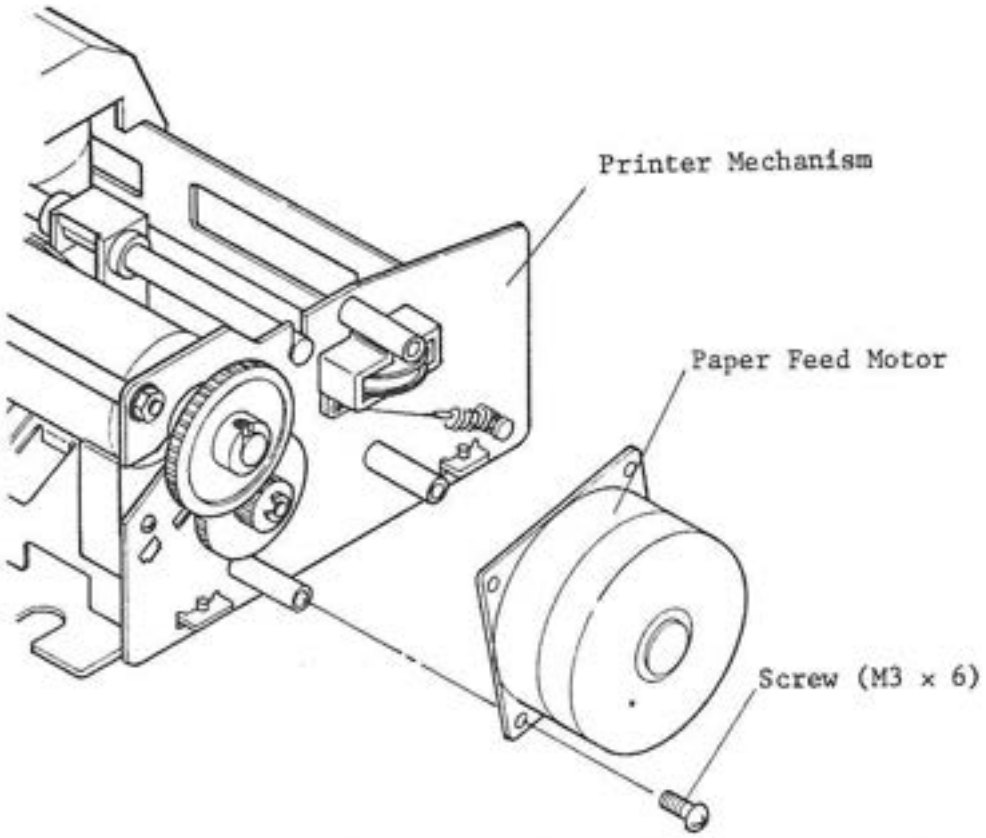


Fig. 5-18 Replacement of Paper Feed Motor Assembly

10. Replacement of Carriage Motor

(1) Remove printer mechanism as described in item 3.

(2) Remove TIE wrap holding lead wires to the carriage motor.

(3) Remove the timing detector board. (See Paragraph 12)

(4) Remove the paper feed motor. (See Paragraph 9)

(5) Remove the thermal print head. (See Paragraph 7)

(6) Remove the drive wire rope.

(7) Remove screws(M3×6×4)fastening motor, and replace a new carrige motor assembly.

(8) Replace the drive wire rope. (See Pragraph 8)

(9) Replace the thermal print head, paper feed moter, and timing detecter board.

(10) Adjust the timing of the timing pulse signal and home position Pulse signal. (See Paragraph 2 of 4. Adjustments)

(11) Apply screw lock to the screw heads.

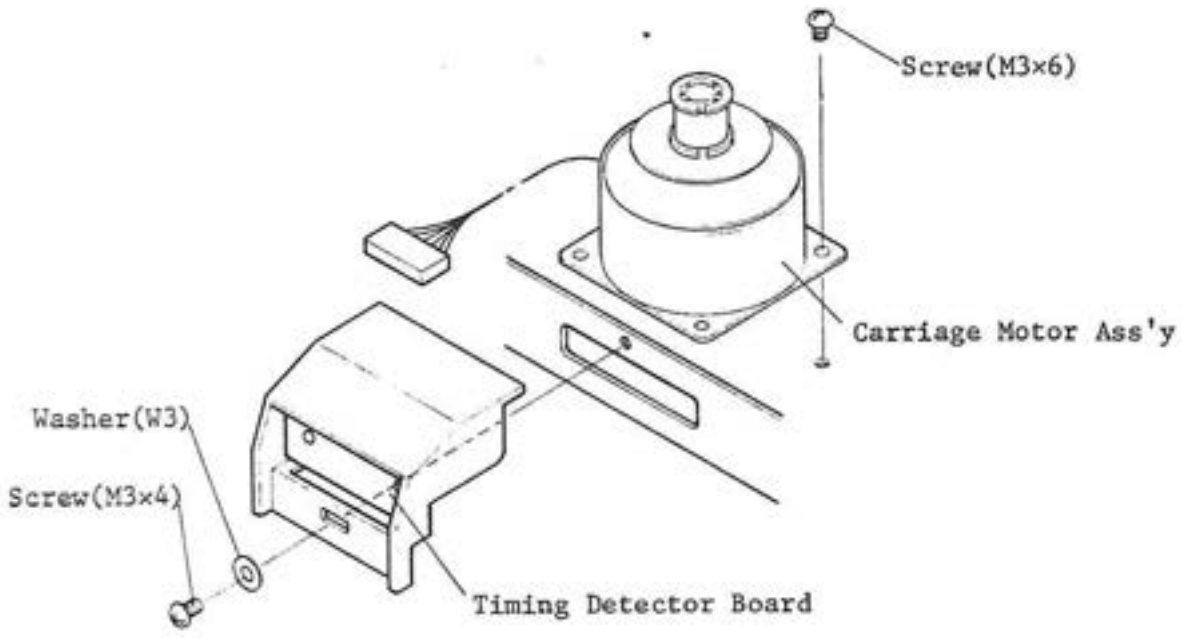


Fig. 5-19 Replacement of Carriage Motor Assembly

11. Replacement of Platen Assembly

(1) Remove upper case by the procedure described in item 1.

(2) Remove printer mechanism by the procedure described in item 3.

(3) Remove paper feed motor assembly by the procedure described in item 8.

(4) Remove the tapping screws (M2 × 5 × 2) of the frames (R) and (L) then the paper guides (R) and (L).

(5) Remove the stop ring (E2) securing the idler gear.

(6) Remove the stop ring (E5) on the platen shaft of the frame (R).

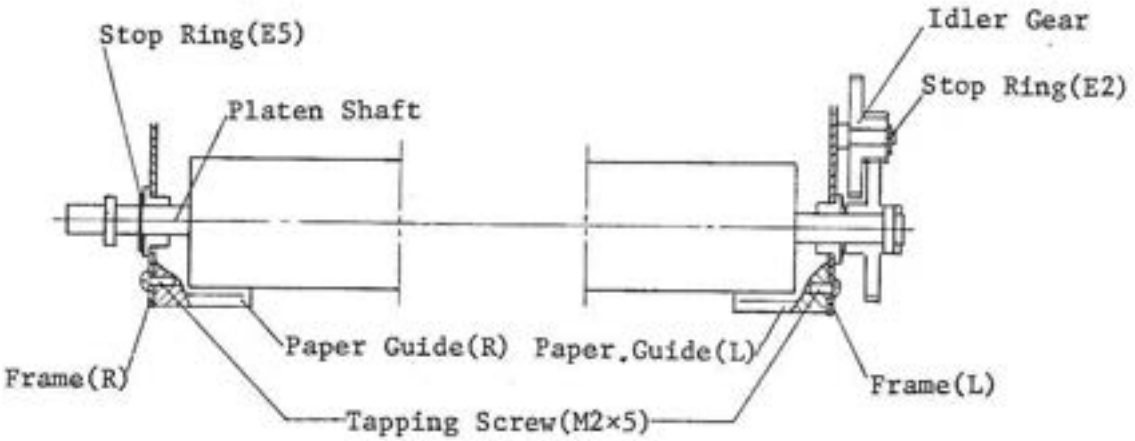


Fig. 5-20 Remove the Stop Ring

(7) Push the platen shaft from the frame (R) to the frame (L) , and remove the bushing from the frame (L).

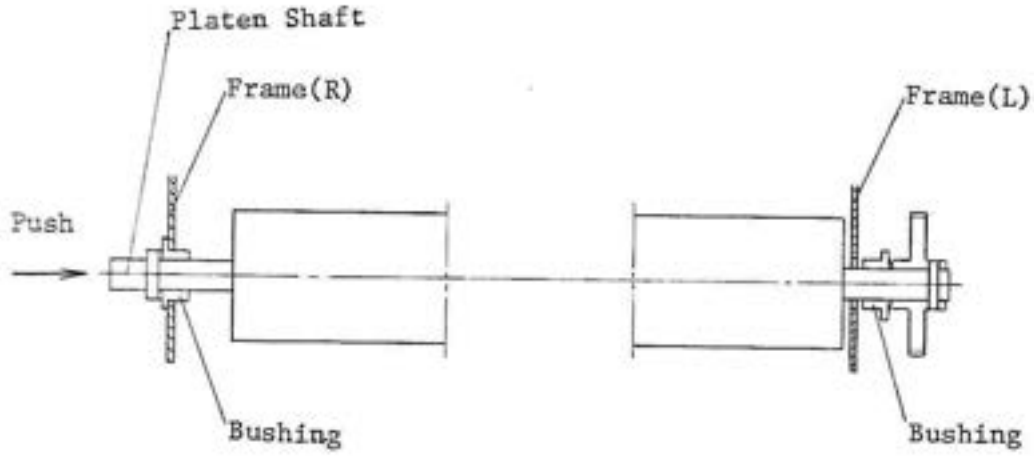


Fig. 5-21 Remove the Bushing

(8) While removing the platen shaft along the guide groove, and remove the bushing of the frame (R).

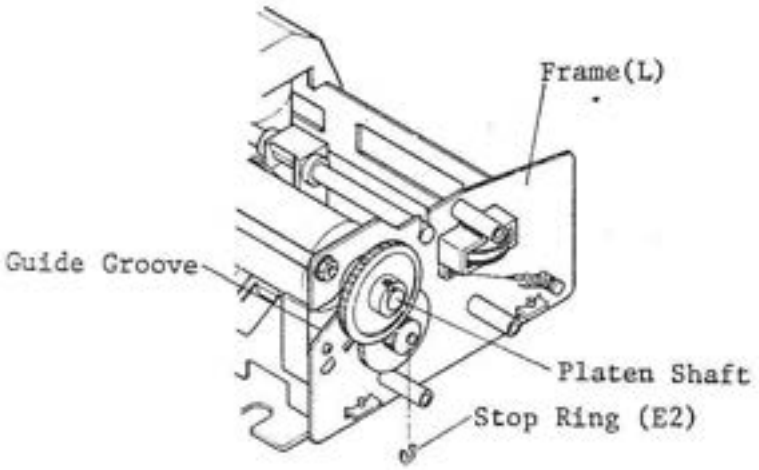


Fig. 5-22 Remove the Platen Shaft

12. Replacement of Detector Board

(1) Remove upper case by the procedure described in item 1.

(2) Remove printer mechanism by the procedure described in item 3.

(3) Remove the mounting screws of the home position detector board and replace it with a new home position detector board.

(4) Remove the mounting screws of the timing detector board and replace it with a new timing detector board.

(5) Attach the printer mechanism to the lower case and engage the connectors (CN3 to CN5 and CN7) with the control logic board.

(6) Adjust the timing of the timing pulse signal and home position pulse signal. (See Paragraph 2 of 4. Adjustment)

(7) Apply screw lock to the screw heads.

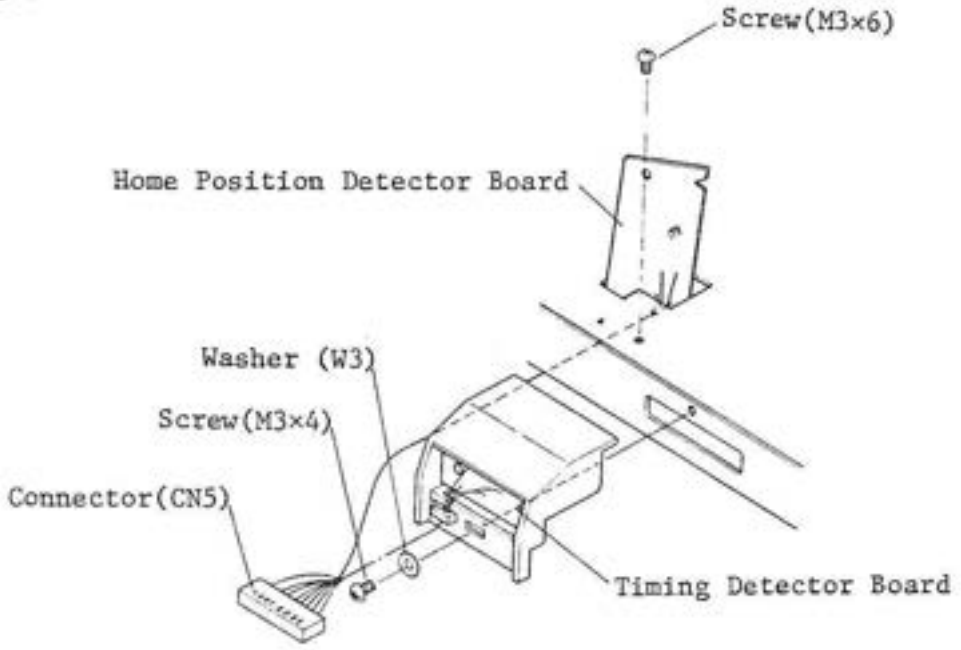


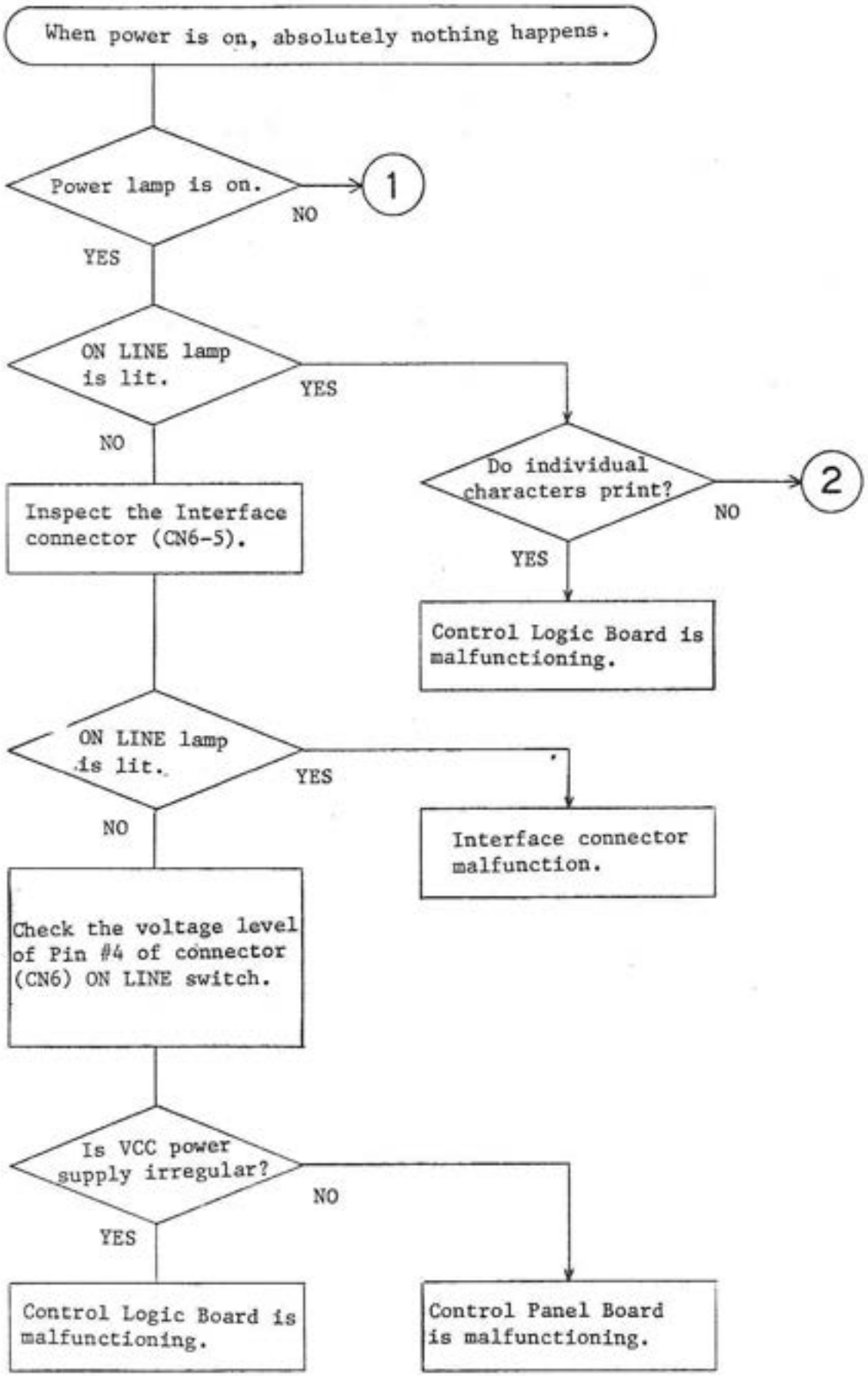
Fig. 5-23 Replacement of Detector Board

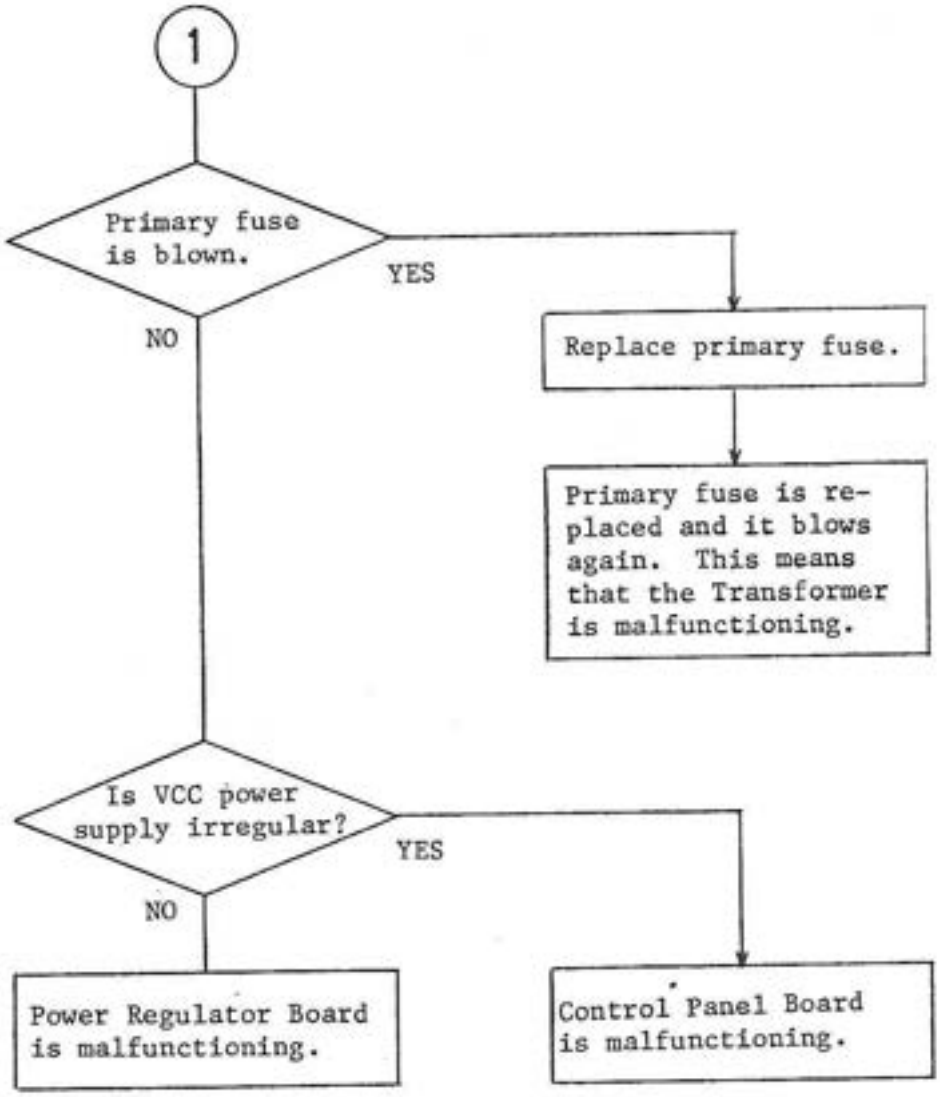
6. TROUBLE-SHOOTING PROCEDURES

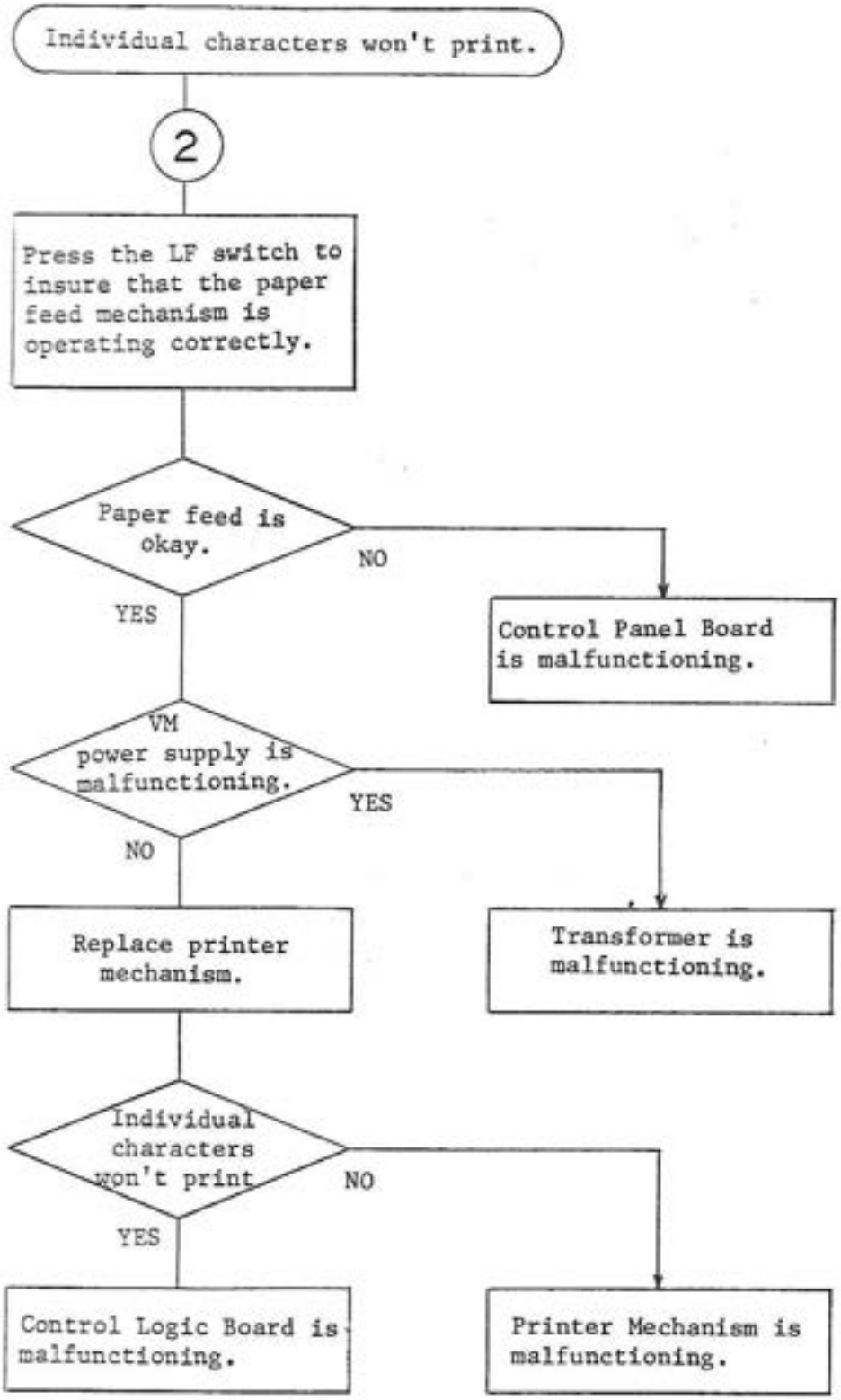
1. Trouble-shooting

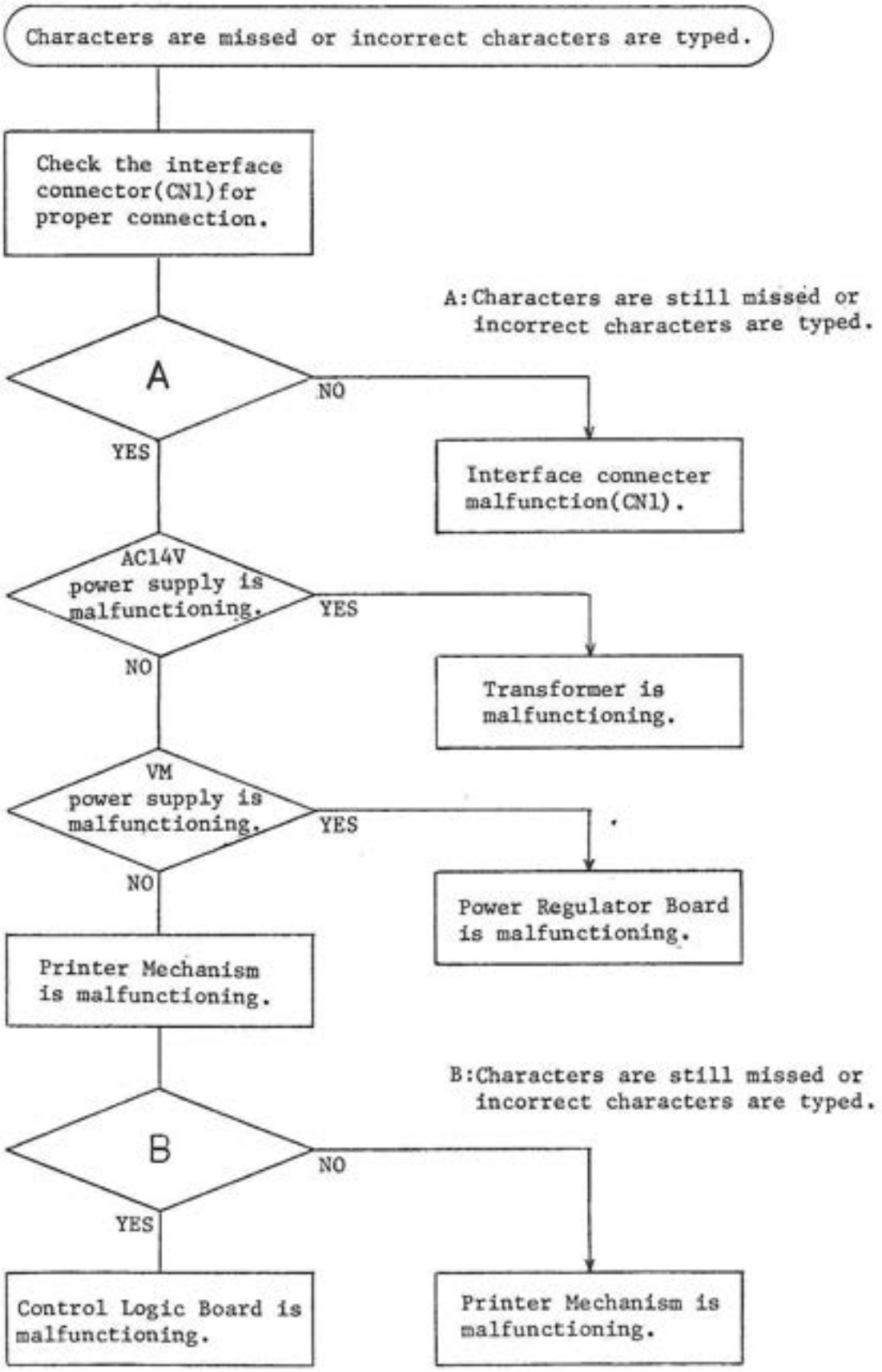
To assist the serviceman in quickly locating the cause of a failure that might be encountered, this Technical Manual provides a series of "trouble-shooting" flow charts that suggest the sequence of steps to be taken in remedying the problem.

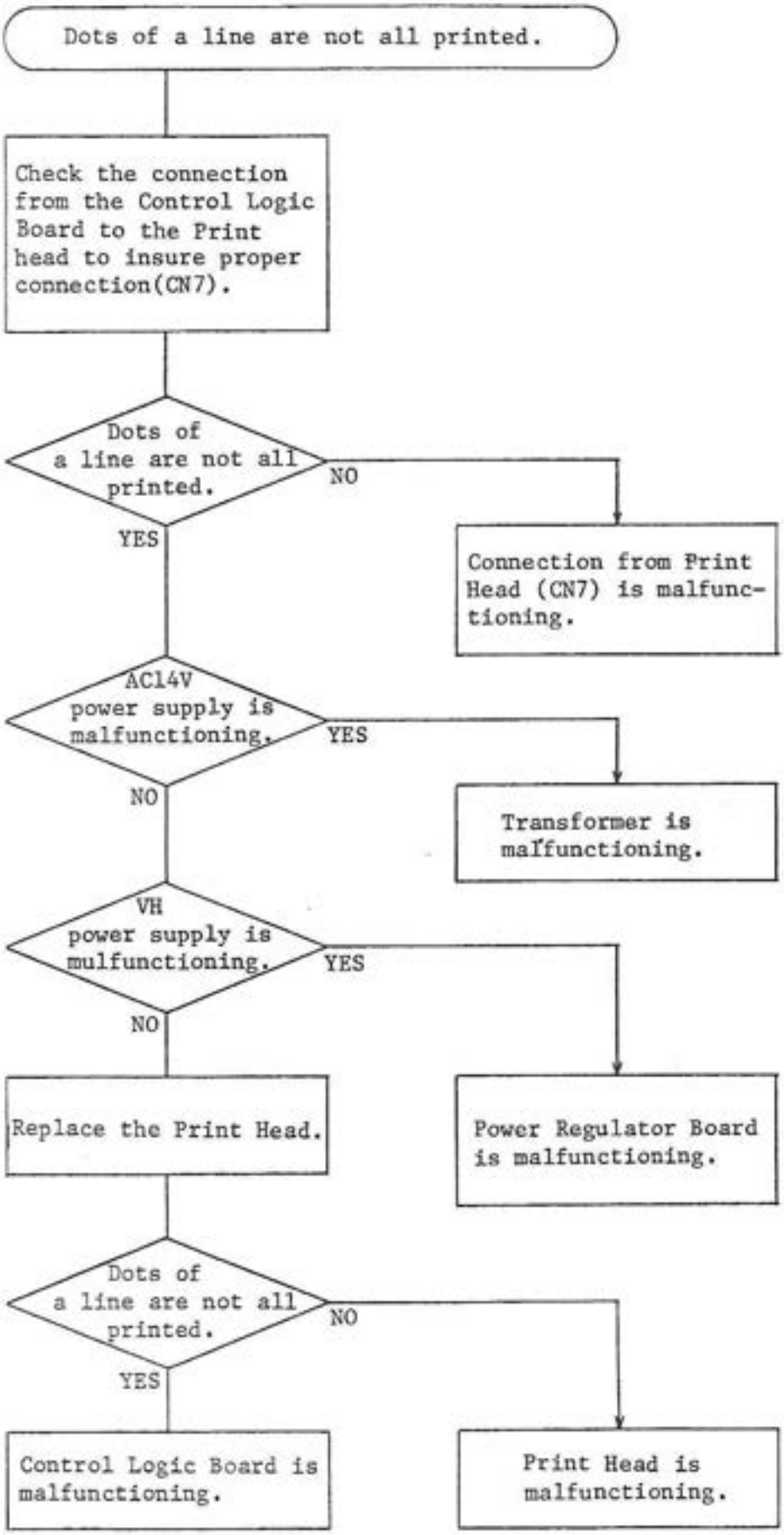
Most of the malfunctions confronting the serviceman can be fixed by following the procedure outlined in the appropriate flowchart. If the flowchart calls for replacement of a defective Unit, care should be taken to insure that the new Unit is in proper working order when exchanged for the old one. It is possible that a malfunction is caused by the simultaneous failure of two interrelated Units (which, of course, is an event not covered by these flowcharts).

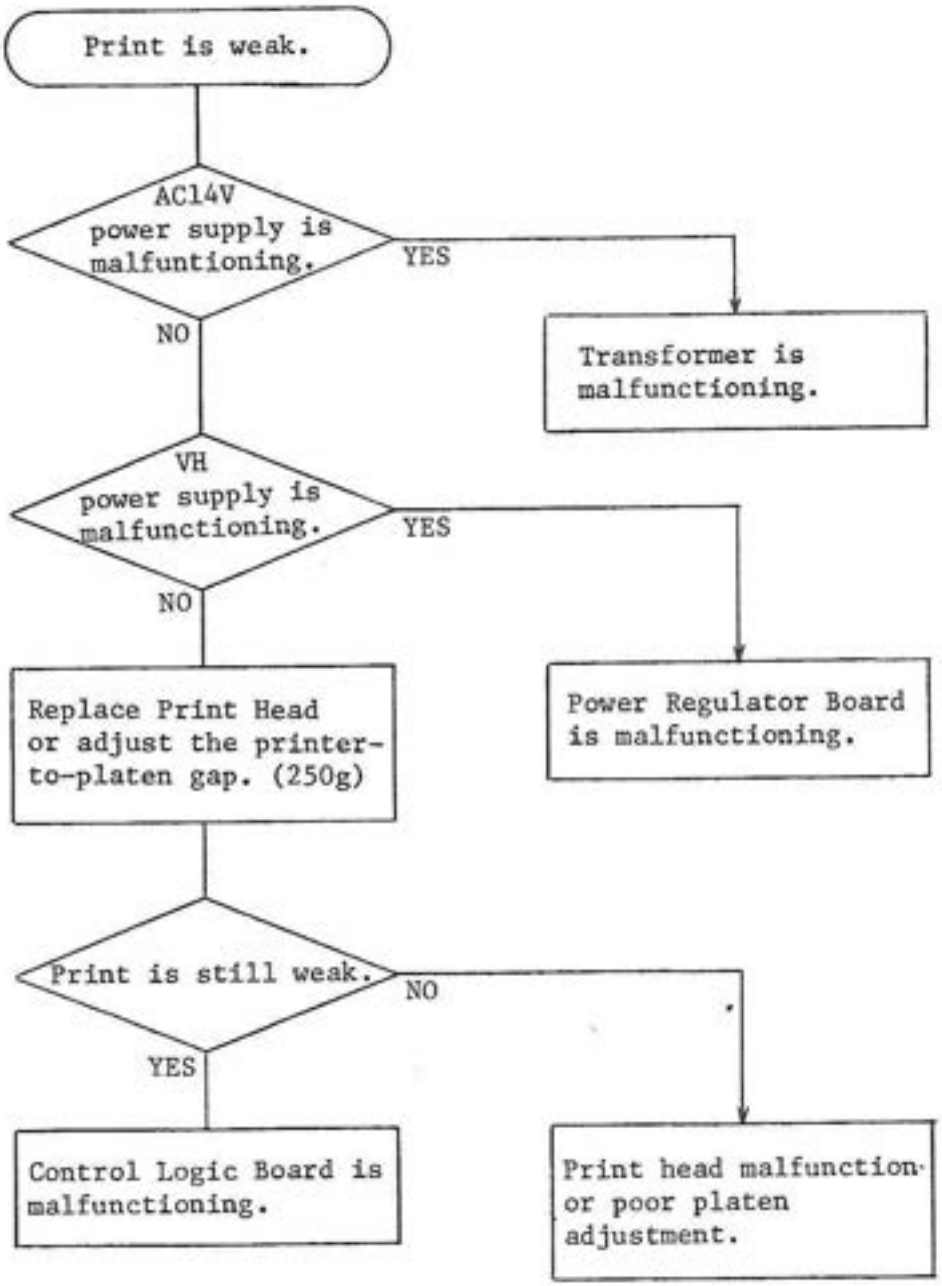

When power is on, absolutely nothing happens.
Power lamp is on.
NO
1
YES
ON LINE lamp is lit.
YES
NO
Do individual characters print?
NO
2
YES
Inspect the Interface connector (CN6-5).
Control Logic Board is malfunctioning.
ON LINE lamp is lit.
YES
NO
Interface connector malfunction.
Check the voltage level of Pin #4 of connector (CN6) ON LINE switch.
Is VCC power supply irregular?
NO
YES
Control Logic Board is malfunctioning.
Control Panel Board is malfunctioning.

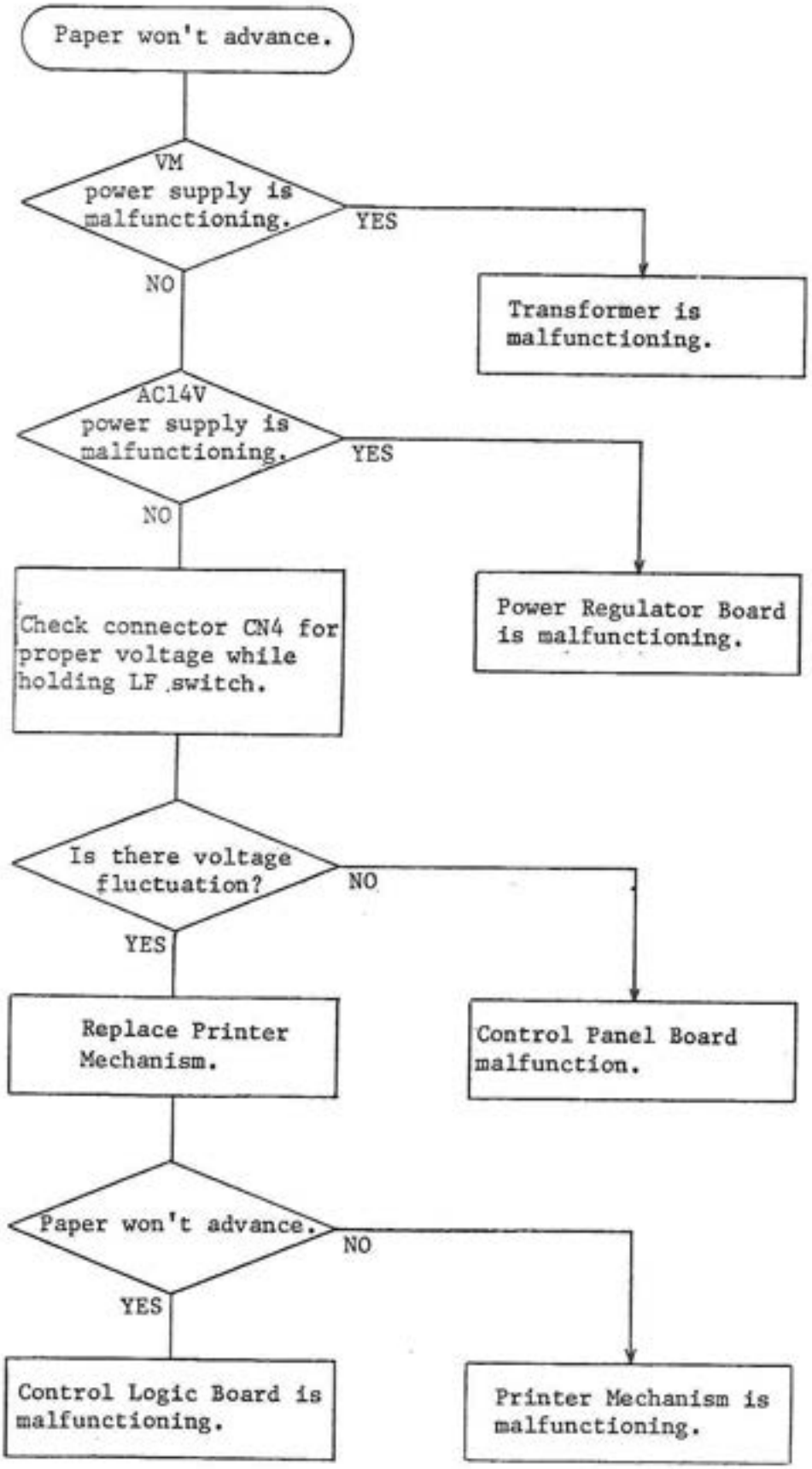

1
Primary fuse is blown.
YES
NO
Replace primary fuse.
Primary fuse is replaced and it blows again. This means that the Transformer is malfunctioning.
Is VCC power supply irregular?
YES
NO
Power Regulator Board is malfunctioning.
Control Panel Board is malfunctioning.

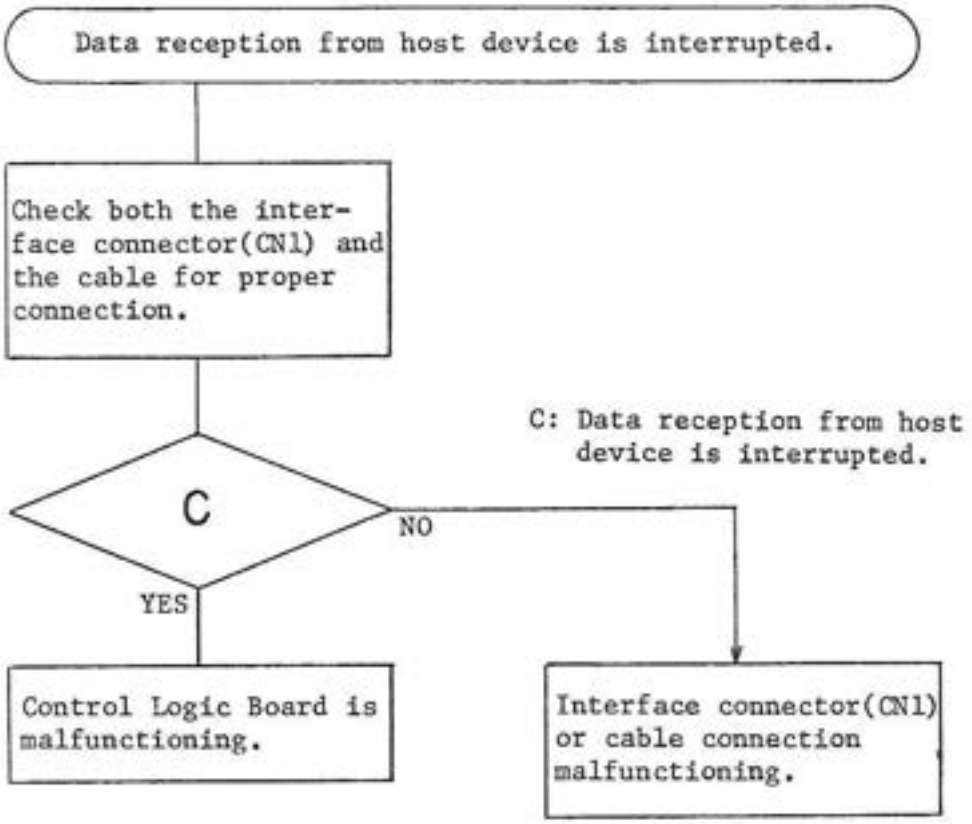

Individual characters won't print.
2
Press the LF switch to insure that the paper feed mechanism is operating correctly.
Paper feed is okay.
NO
YES
Control Panel Board is malfunctioning.
VM power supply is malfunctioning.
YES
NO
Replace printer mechanism.
Transformer is malfunctioning.
Individual characters won't print
NO
YES
Control Logic Board is malfunctioning.
Printer Mechanism is malfunctioning.


Characters are missed or incorrect characters are typed.
Check the interface connector(CN1)for proper connection.
A:Characters are still missed or incorrect characters are typed.
A
NO
YES
Interface connecter malfunction(CN1).
AC14V power supply is malfunctioning.
YES
NO
Transformer is malfunctioning.
VM power supply is malfunctioning.
YES
NO
Power Regulator Board is malfunctioning.
Printer Mechanism is malfunctioning.
B:Characters are still missed or incorrect characters are typed.
B
NO
YES
Control Logic Board is malfunctioning.
Printer Mechanism is malfunctioning.


Dots of a line are not all printed.
Check the connection from the Control Logic Board to the Print head to insure proper connection(CN7).
Dots of a line are not all printed.
NO
Connection from Print Head (CN7) is malfunctioning.
YES
AC14V power supply is malfunctioning.
YES
Transformer is malfunctioning.
NO
VH power supply is mulfunctioning.
YES
Power Regulator Board is malfunctioning.
NO
Replace the Print Head.
Dots of a line are not all printed.
NO
Print Head is malfunctioning.
YES
Control Logic Board is malfunctioning.


Print is weak.
AC14V power supply is malfuntioning.
YES
Transformer is malfunctioning.
NO
VH power supply is malfunctioning.
YES
Power Regulator Board is malfunctioning.
NO
Replace Print Head or adjust the printer-to-platen gap. (250g)
Print is still weak.
NO
Print head malfunction or poor platen adjustment.
YES
Control Logic Board is malfunctioning.


Paper won't advance.
VM power supply is malfunctioning.
YES
Transformer is malfunctioning.
NO
AC14V power supply is malfunctioning.
YES
Power Regulator Board is malfunctioning.
NO
Check connector CN4 for proper voltage while holding LF switch.
Is there voltage fluctuation?
NO
Control Panel Board malfunction.
YES
Replace Printer Mechanism.
Paper won't advance.
NO
Printer Mechanism is malfunctioning.
YES
Control Logic Board is malfunctioning.


Data reception from host device is interrupted.
Check both the interface connector(CN1) and the cable for proper connection.
C: Data reception from host device is interrupted.
C
NO
YES
Control Logic Board is malfunctioning.
Interface connector(CN1) or cable connection malfunctioning.

7. PARTS LIST

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1. Notice

There are five cases in the parts list as below.

Case 1: Effective to All

Case 2: Effective to Serial No. 6003000709

Case 3: Effective from Serial No. 6003000710

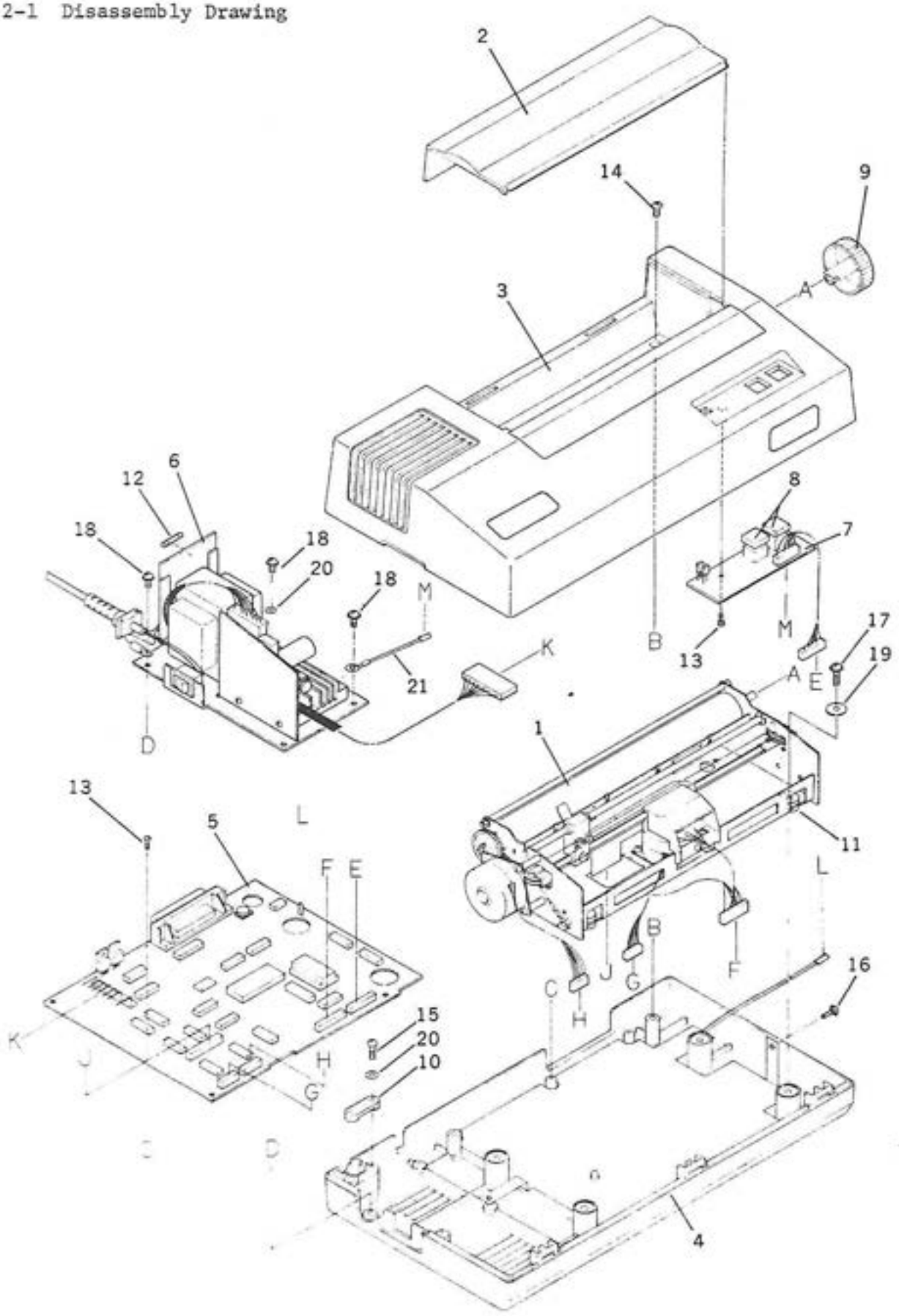
Case 4: Effective to Serial No. 6003002249

Case 5: Effective from Serial No. 6003002250

Whenever you replace any parts, it is necessary to check the serial number which is shown on the identification plate, and replace the correct part.

2. STX-80/-80T Printer Assembly

2-1 Disassembly Drawing

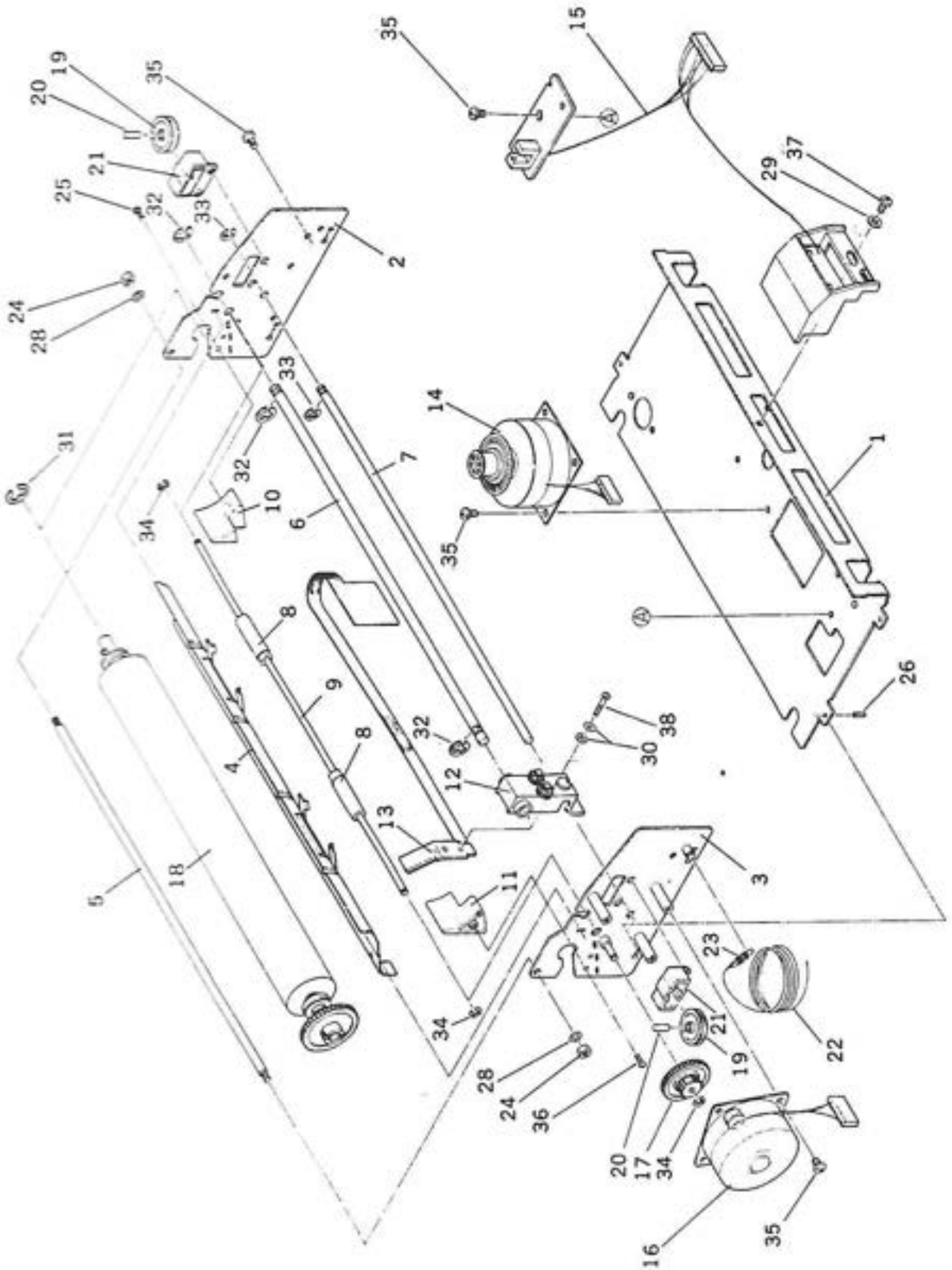


2-2 Parts List

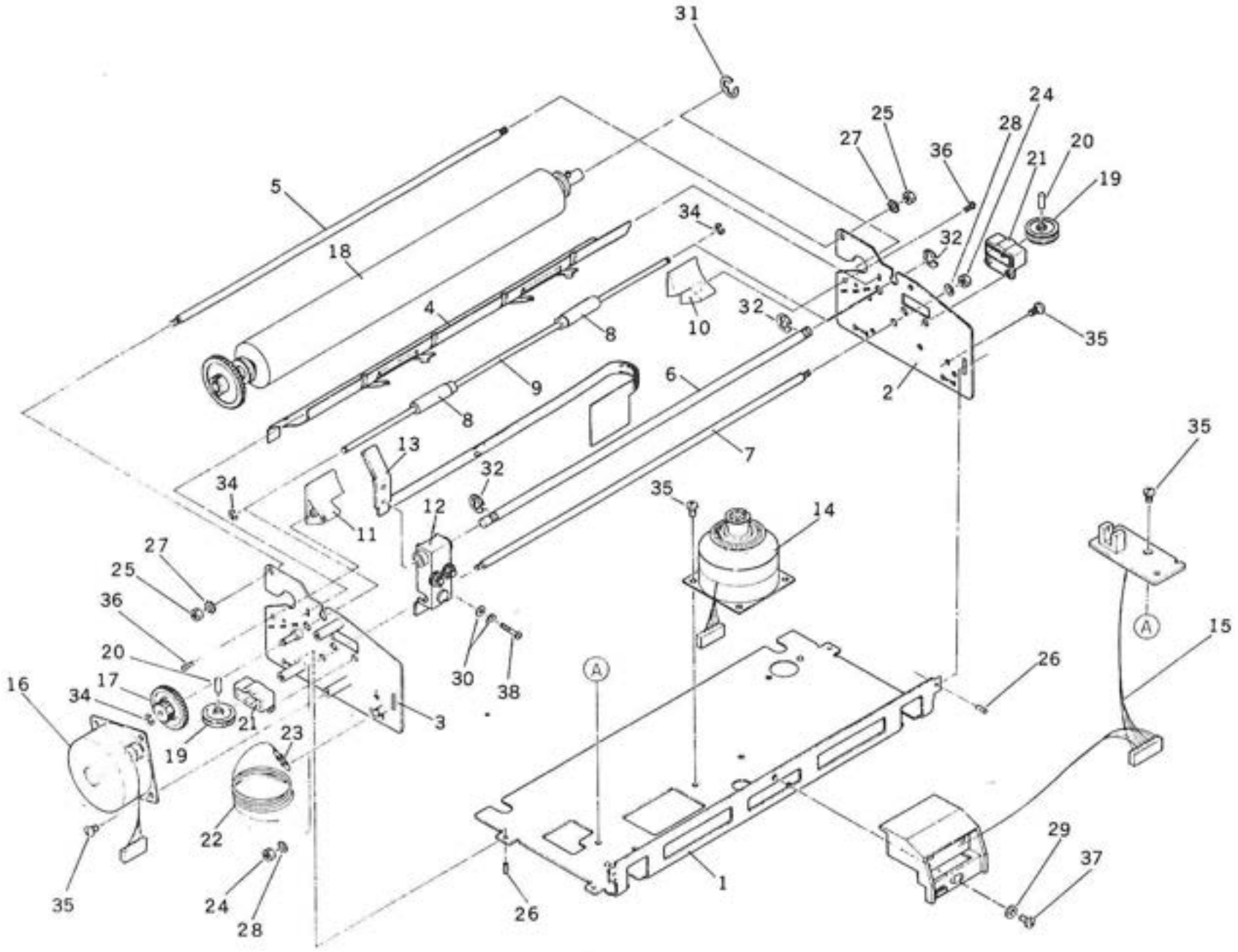
Drwg. No.	Parts Name	Parts No.	Q'ty	Serial No.
1	Printer Mechanism	89300000	1	
2	Printer Cover	83020240	1	
3	Upper Case Assembly			
	(STX-80 for USA)	87350340	1	
	(STX-80 except for USA)	87350310	1	
	(STX-80T except for USA)	87350330	1	
4	Lower Case Assembly	87351010	1	
5	Control Logic Board	87352010	1	to 6003002249
		87352011	1	from 6003002250
6	Power Supply Unit			
	(120 VAC)	87353010	1	
	(220 VAC)	87353030	1	
	(240 VAC without connector)	87353040	1	
	(240 VAC with connector)	87353050	1	
7	Control Panel Board Unit	87350320	1	
8	Key-Top	83900500	2	
9	Platen Knob	83120130	1	
10	Cord Clamp	83910360	1	to 6003002249
		83910361	1	from 6003002250
11	Rubber Foot	80200160	4	
12	Fuse			
	(5MT600, for 120 VAC)	09990022	1	
	(315mA/250V, for 220/240 VAC)	09990024	1	
13	Tapping Screw M3 × 8	00930803	7	
14	Screw M4 × 8	01604081	2	
15	Screw M4 × 12	01604120	2	
16	Screw with Washer M3 × 6	01903018	1	
17	Screw with Notched Washer M4 × 14	01914005	4	
18	Screw with Notched Washer M4 × 8	01914007	6	
19	Collar	82200080	4	
20	Washer W4	02204001	3	
21	Frame Ground Lead Wire	80921950	1	

3. Printer Mechanism

3-1 Disassembly Drawing



(This drawing is effective to Serial No. 6003002249)



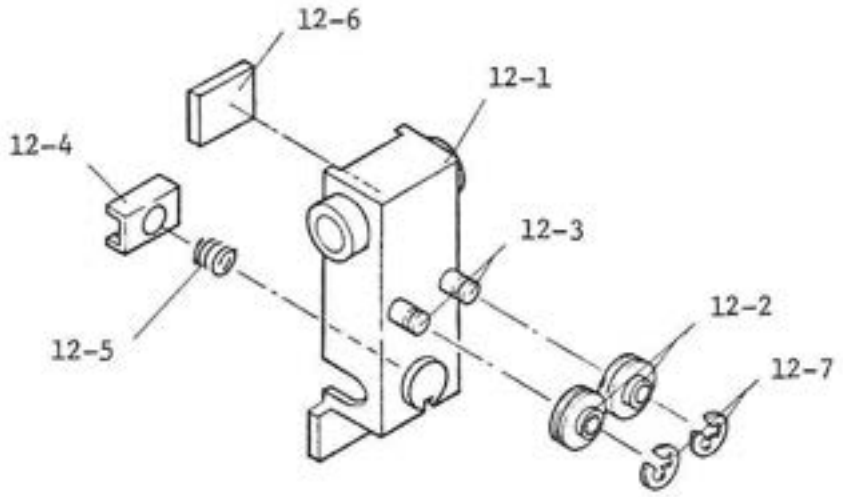
(This drawing is effective from Serial No. 6003002250)

3-2 Parts List

Drwg. No.	Parts Name	Parts No.	Q'ty	Serial No.
1	Frame Base	82010280	1	to 6003002249
		82010281	1	from 6003002250
2	Frame (R)	82000290	1	to 6003002249
		82000291	1	from 6003002250
3	Frame (L) Assembly	87300310	1	to 6003002249
		87300310	1	from 6003002250
4	Paper Chute Assembly	87300320	1	
5	Frame Stay	81370210	1	to 6003002249
		81370211	1	from 6003002250
6	Carriage Stay (1)	81360170	1	to 6003000709
		81360171	1	from 6003000710
7	Carriage Stay (2)	81360180	1	to 6003002249
		81360181	1	from 6003002250
8	Pressure Roller	83200210	2	
9	Pressure Roller Shaft	81360190	1	to 6003002249
		81360191	1	from 6003002250
10	Paper Guide (R)	83910400	1	
11	Paper Guide (L)	83910410	1	
12	Carriage Assembly	87302010	1	
13	Thermal Print Head Assembly	87301010	1	
14	Carriage Motor Assembly	87304010	1	
15	Detector Board Assembly	87307010	1	
16	Paper Feed Motor Assembly	87305010	1	
17	Idler Gear	83100140	1	
18	Platen Assembly	87303010	1	
19	Reverse Pulley	83200190	2	
20	Reverse Pulley Shaft	81300670	2	
21	Reverse Pulley Support	83900330	2	
22	Wire Rope	80990470	1	
23	Tension Spring	80510310	1	
24	Nut NH3-1	02010301	2	
25	Nut NH3-3	02030301	2	from 6003002250
26	Roll Pin SPP2-8	04012003	4	to 6003002249
			6	from 6003002250
27	Notched Washer WB3	02110301	2	from 6003002250
28	Spring Washer WS3	02410301	2	
29	Washer W3	02203002	1	
30	Washer W2	02202001	2	
31	Stop Ring E5	04020017	1	
32	Stop Ring E4	04020016	2	to 6003000709
			3	from 6003000710
33	Stop Ring E3	04020015	2	to 6003002249
34	Stop Ring E2	04020010	3	
35	Screw with Washer M3 × 6	01903018	9	
36	Tapping Screw M2 × 5	00920500	2	
37	Screw M3 × 4	00630404	1	
38	Screw M2 × 12	01902020	1	
--	Plastic Fastener	04991204	2	

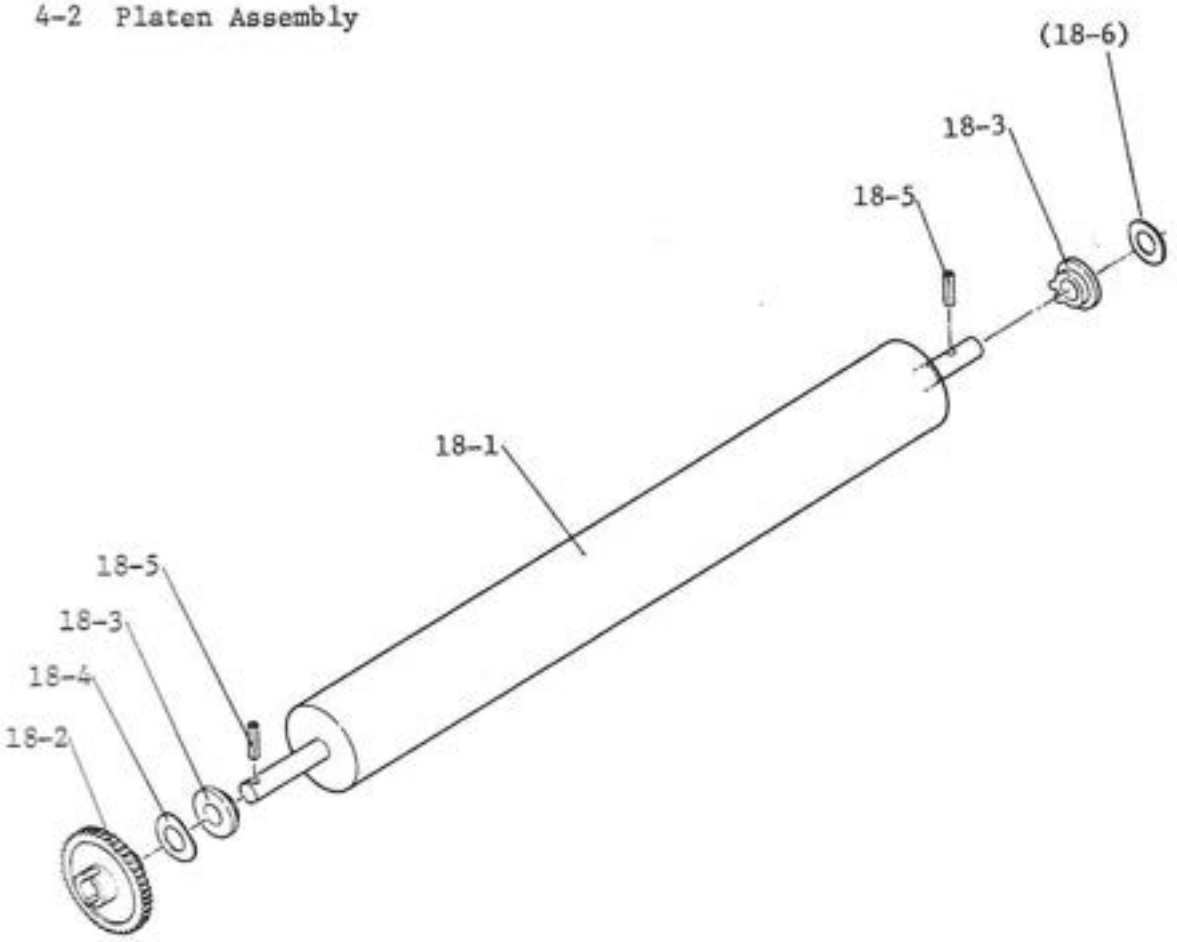
4. Sub-Assembly Parts of Printer Mechanism

4-1 Carriage Assembly



Drwg. No.	Parts Name	Parts No.	Q'ty	Serial No.
12-1	Carriage	83900320	1	to 6003000709
		83900321	1	from 6003000710
12-2	Print Head Pulley	83200180	2	
12-3	Print Head Pulley Shaft	81310370	2	
12-4	Retainer	83900340	1	to 6003000709
		83900341	1	from 6003000710
12-5	Retainer Spring	80520140	1	to 6003002249
		80520150	1	from 6003002250
12-6	Felt	80990380	1	
12-7	Stop Ring E2	04020010	2	

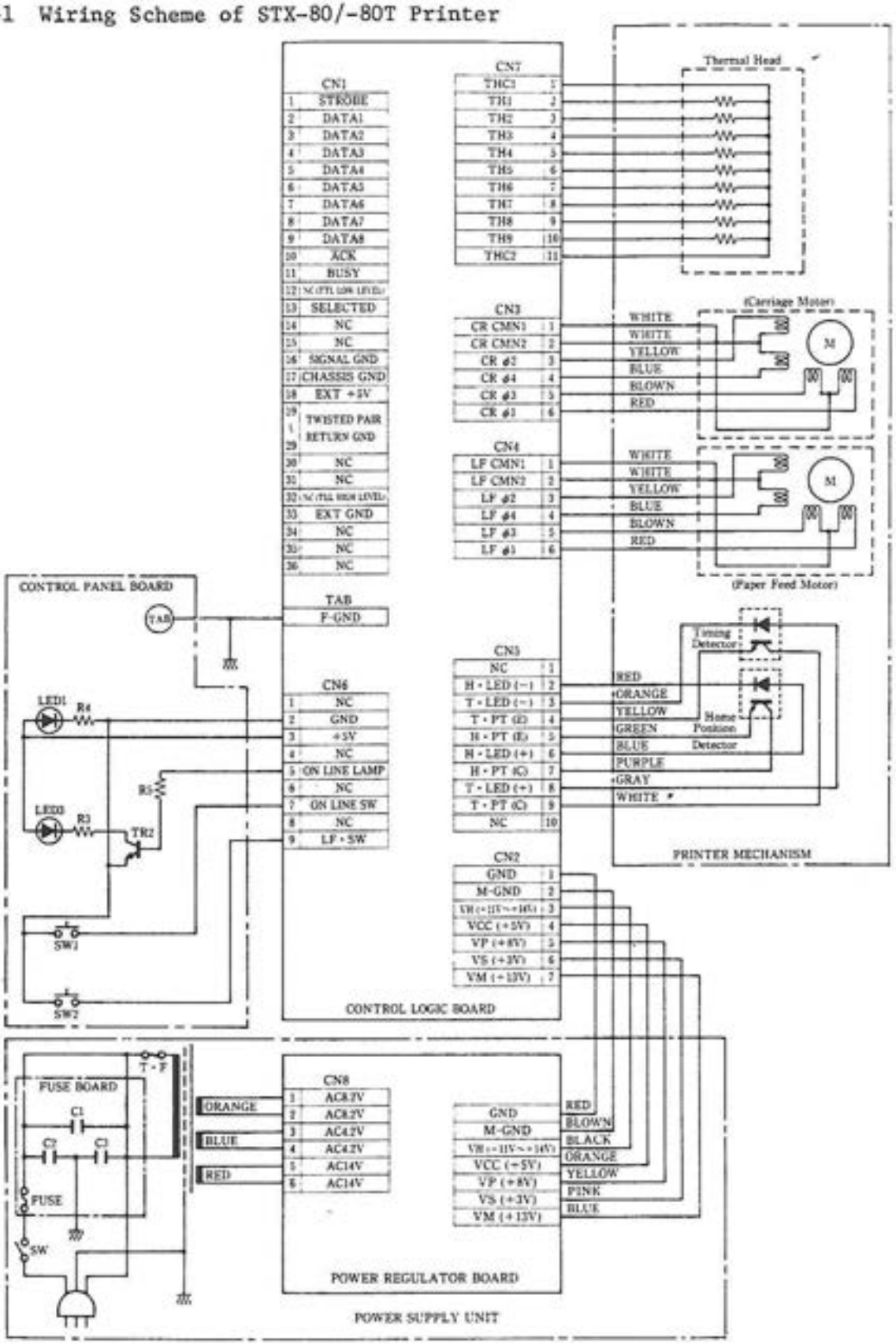
4-2 Platen Assembly



Drwg. No.	Parts Name	Parts No.	Q'ty	Serial No.
18-1	Platen	80200220	1	
18-2	Platen Gear	83100130	1	to 6003002249
		83100131	1	from 6003002250
18-3	Bushing	83200200	1	to 6003002249
		83200201	1	from 6003002250
18-4	Wave Washer	82500100	1	
18-5	Roll Pin SPP2-5-10	04012501	2	
18-6	Poly-Slider WP7 × 0.5	02307050	1	to 6003000709

5. Circuit Diagram

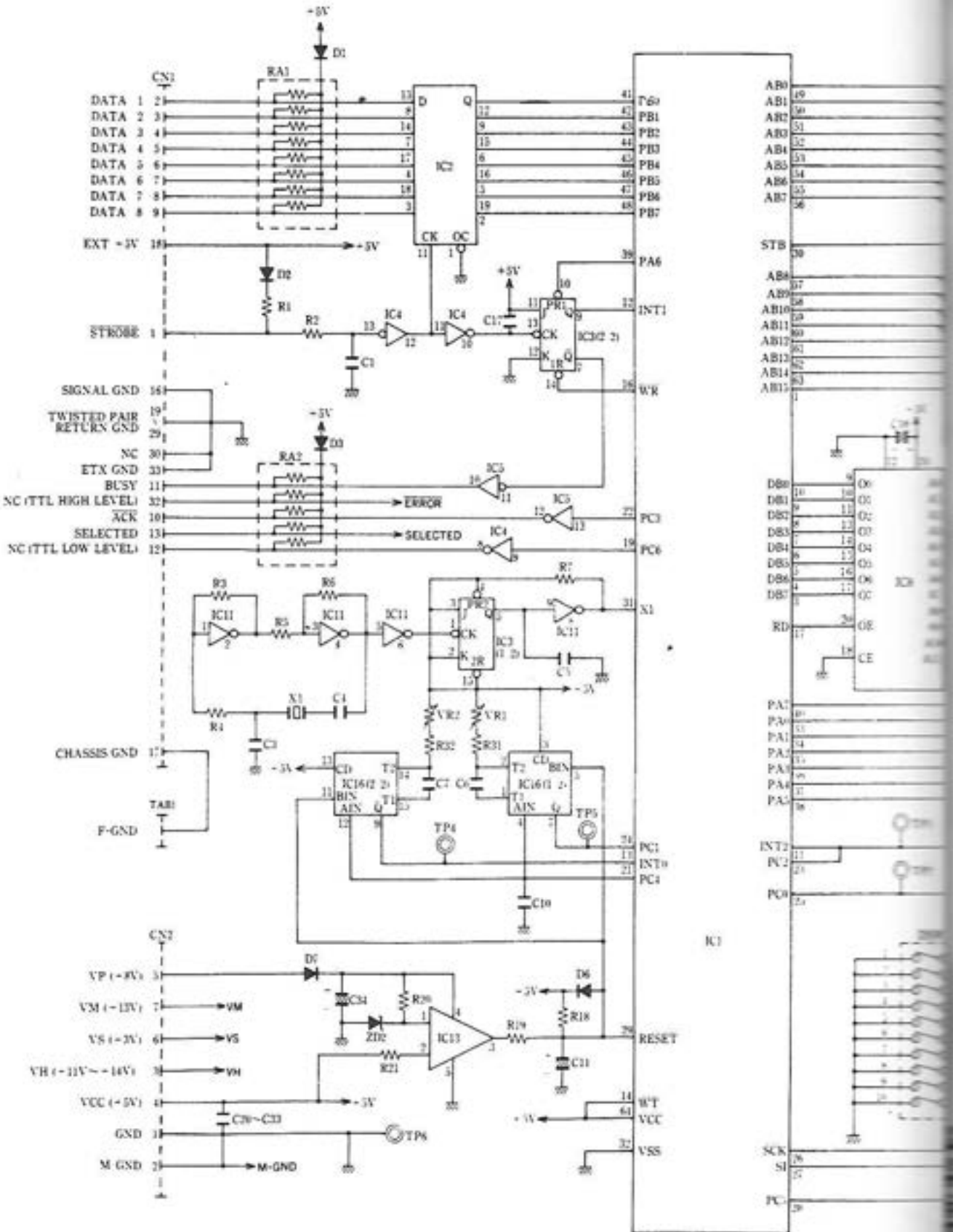
5-1 Wiring Scheme of STX-80/-80T Printer

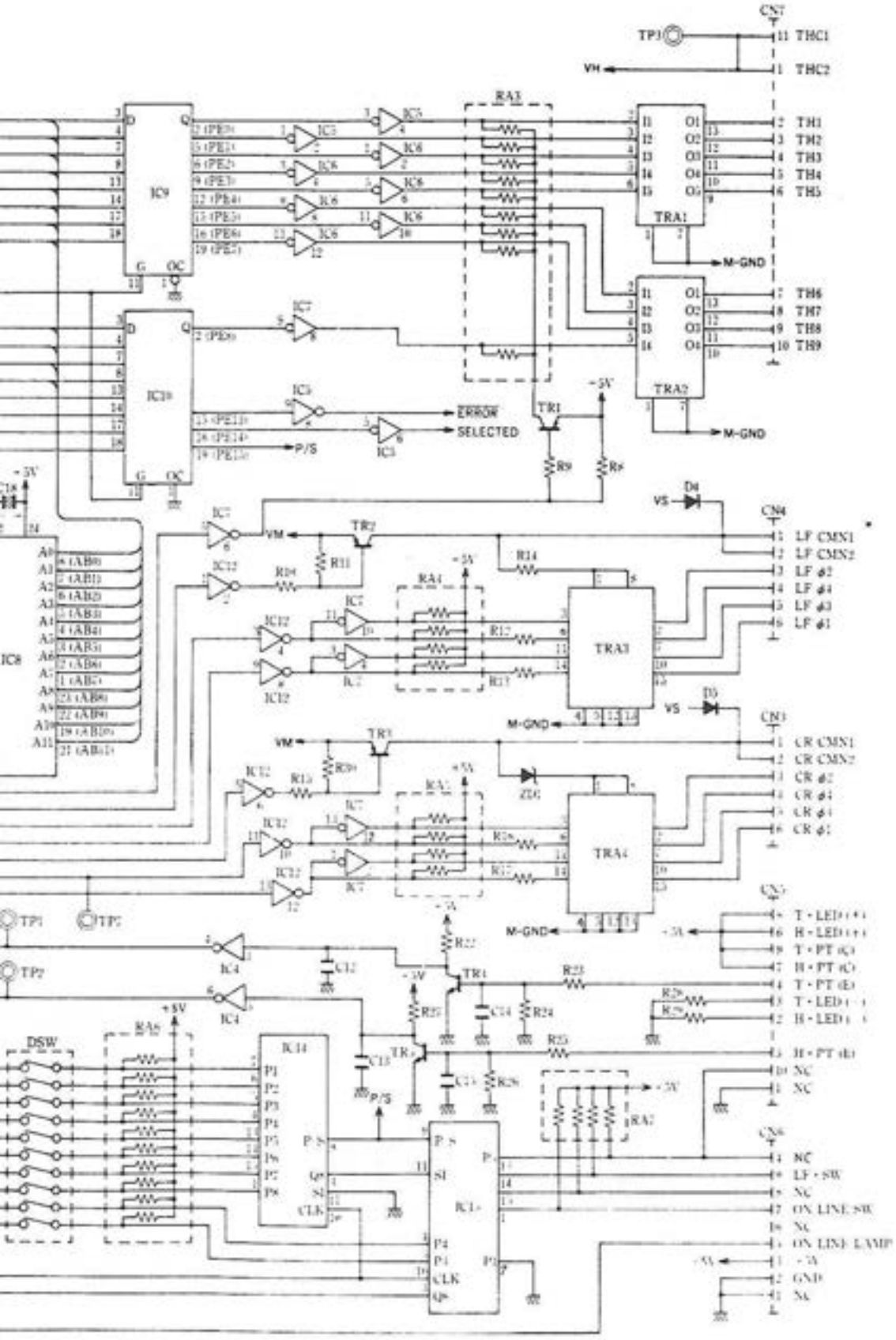


5-2 Control Logic Board (Part No. 87352010)

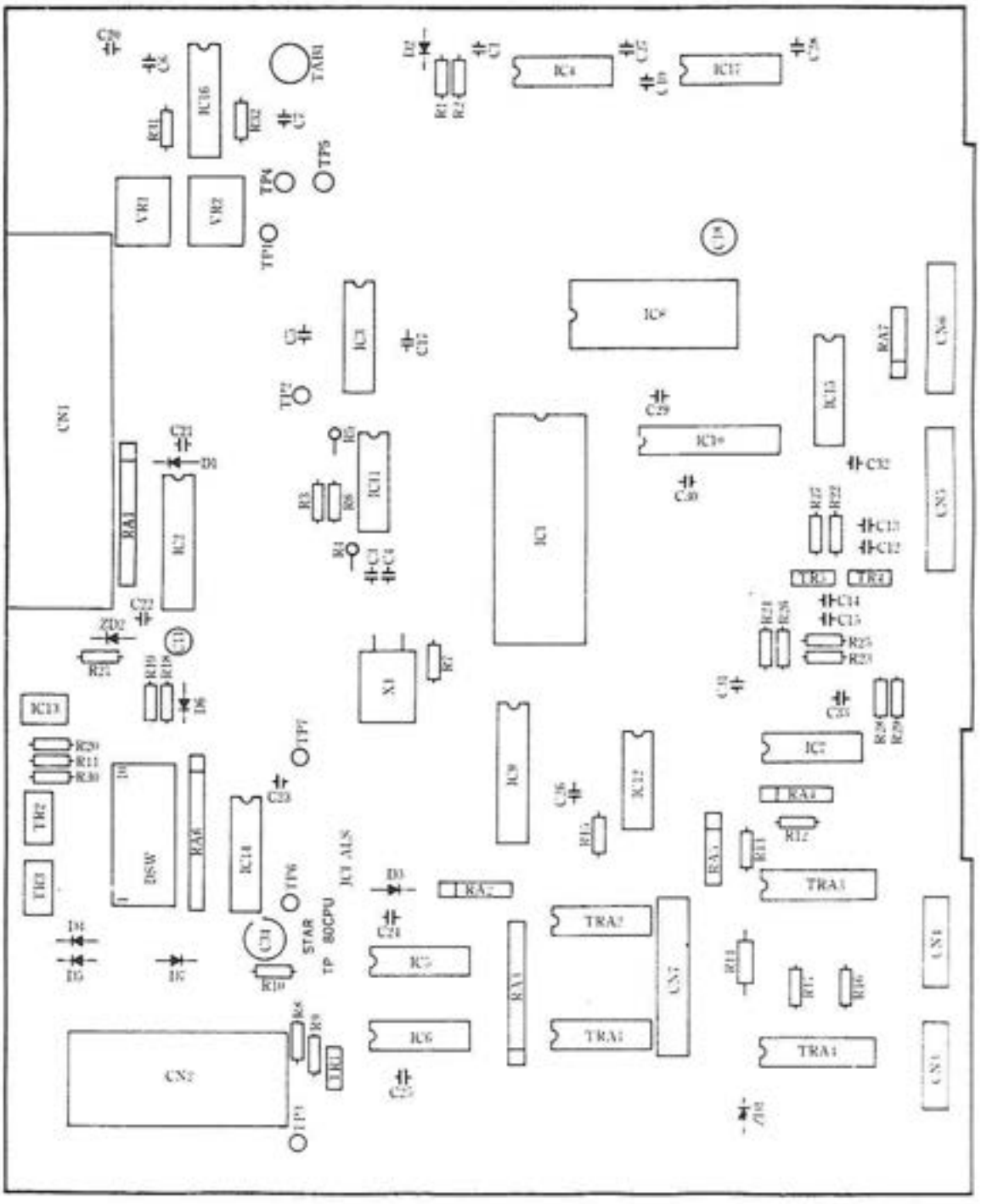
Followings are effective to the Serial No. 6003002249.

(1) Circuit Diagram




CN7
TP3
VH
11 THC1
1 THC2
RA3
IC9
IC5
IC6
IC8
IC7
IC10
IC3
TRA1
TRA2
2 TH1
3 TH2
4 TH3
5 TH4
6 TH5
7 TH6
8 TH7
9 TH8
10 TH9
M-GND
ERROR
SELECTED
P/S
TR1
-5V
R9
R8
D4
VS
CN4
TR2
VM
R11
R10
R14
RA4
TRA3
1 LF CMN1
2 LF CMN2
3 LF φ2
4 LF φ4
5 LF φ3
6 LF φ1
D5
CN1
TR3
R13
R12
ZD1
TRA4
1 CR CMN1
2 CR CMN2
3 CR φ2
4 CR φ4
5 CR φ3
6 CR φ1
CN2
TP1
TP2
TP7
IC4
C12
R22
TR4
R21
R23
R25
R24
C14
C13
TR5
R26
R27
R28
R29
C15
R30
RA5
RA7
DSW
IC14
IC11
P/S
SI
CLK
C16
1 T-LED(+)
6 H-LED(+)
9 T-PT(C)
7 H-PT(C)
4 T-PT(E)
3 T-LED(-)
2 H-LED(-)
5 H-PT(E)
10 NC
11 NC
CN6
1 NC
9 LF-SW
5 NC
7 ON LINE SW
8 NC
4 ON LINE LAMP
1 +5V
2 GND
11 NC

(2) Component Layout



(3) Electric Parts List

Drwg. No.	Parts Name	Parts Spec.	Parts No.
IC 1	CPU	μPD7800G	08220029
IC 2	TTL	74LS374	08210052
IC 3	TTL	74LS112	08210051
IC 4	TTL	74LS14	08210023
IC 5	TTL	74LS05	08210017
IC 6	TTL	74LS05	08210017
IC 7	TTL	74LS05	08210017
IC 8	ROM	μPD2732D	08220014 *
	(It is necessary to tell the seal mark on the ROM)		
IC 9	TTL	74LS373	08210038
IC 10	TTL	74LS373	08210038
IC 11	TTL	7404	08200009
IC 12	TTL	7406	08210006
IC 13	IC	M51204	08200040
IC 14	IC	HD14014	08210049
IC 15	IC	HD14014	08210049
IC 16	IC	TC4538BP	08230011
TRA 1	Transistor Arrey	μPA53C or BA612	07650002
TRA 2	Transistor Arrey	μPA53C or BA612	07650002
TRA 3	Transistor Arrey	M54532P	07650001
TRA 4	Transistor Arrey	M54532P	07650001
TR 1	Transistor	2SA1175 JHFE	07011751
TR 2	Transistor	2SB707	07107071
TR 3	Transistor	2SB707	07107071
TR 4	Transistor	2SC2785 JHFE	07227851
TR 5	Transistor	2SC2785 JHFE	07227851
ZD 1	Zener Diode	RD20FB2	08020020
ZD 2	Zener Diode	RD4.7EL1	08020027
D 1	Diode	1S1588	08000001
D 2	Diode	1S1588	08000001
D 3	Diode	1S1588	08000001
D 4	Diode	W03B	08020025
D 5	Diode	W03B	08020025
D 6	Diode	1S1588	08000001
D 7	Diode	W03B	08020025
VR 1	Variable Resistor	100kΩ	06451043
VR 2	Variable Resistor	100kΩ	06451043
RA 1	Resistor Arrey	4.7kΩ 8-element	06584723
RA 2	Resistor Arrey	4.7kΩ 4-element	06584721
RA 3	Resistor Arrey	1 kΩ 9-element	06581022
RA 4	Resistor Arrey	1 kΩ 4-element	06581023
RA 5	Resistor Arrey	1 kΩ 4-element	06581023
RA 6	Resistor Arrey	10kΩ 10-element	06581033
RA 7	Resistor Arrey	10kΩ 4-element	06581031

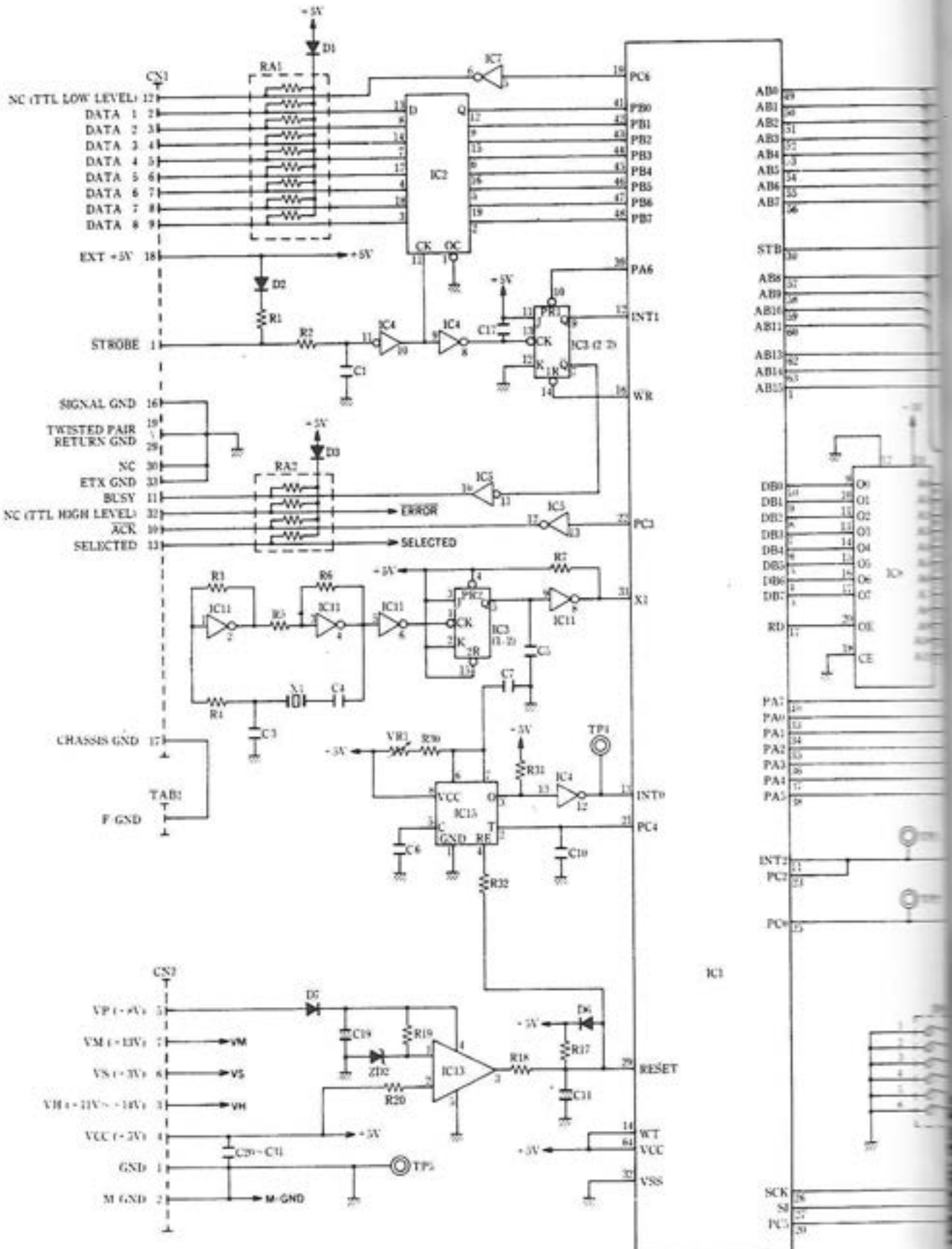
Drwg. No.	Parts Name	Parts Spec.	Parts No.
R 1	Resistor	10kΩ 1/4W	06041031
R 2	Resistor	100Ω 1/4W	06041011
R 3	Resistor	820Ω 1/4W	06048211
R 4	Resistor	220Ω 1/4W	06042212
R 5	Resistor	220Ω 1/4W	06042212
R 6	Resistor	1.8kΩ 1/4W	06041821
R 7	Resistor	10kΩ 1/4W	06041031
R 8	Resistor	10kΩ 1/4W	06041031
R 9	Resistor	2.2kΩ 1/4W	06042221
R 10	Resistor	2.2kΩ 1/4W	06042221
R 11	Resistor	10kΩ 1/4W	06041031
R 12	Resistor	1 kΩ 1/4W	06041021
R 13	Resistor	1 kΩ 1/4W	06041021
R 14	Resistor	330Ω 2 W	06203311
R 15	Resistor	2.2kΩ 1/4W	06042221
R 16	Resistor	1 kΩ 1/4W	06041021
R 17	Resistor	1 kΩ 1/4W	06041021
R 18	Resistor	100kΩ 1/4W	06041041
R 19	Resistor	100Ω 1/4W	06041011
R 20	Resistor	4.7kΩ 1/4W	06044721
R 21	Resistor	10kΩ 1/4W	06041031
R 22	Resistor	4.7kΩ 1/4W	06044721
R 23	Resistor	270Ω 1/4W	06042711
R 24	Resistor	27kΩ 1/4W	06042731
R 25	Resistor	270Ω 1/4W	06042711
R 26	Resistor	6.8kΩ 1/4W	06046821
R 27	Resistor	4.7kΩ 1/4W	06044721
R 28	Resistor	180Ω 1/4W	06041811
R 29	Resistor	180Ω 1/4W	06041811
R 30	Resistor	10kΩ 1/4W	06041031
R 31	Resistor	4.7kΩ 1/4W	06044721
R 32	Resistor	4.7kΩ 1/4W	06044721
C 1	Ceramic Capacitor	470pF 50V	05154713
C 2			
C 3	Ceramic Capacitor	51pF 50V	05155101
C 4	Ceramic Capacitor	100pF 50V	05151014
C 5	Ceramic Capacitor	470pF 50V	05154713
C 6	Film Capacitor	0.01μF 50V	05151033
C 7	Film Capacitor	0.01μF 50V	05151033
C 8			
C 9			
C 10	Ceramic Capacitor	1000pF 25V	05131021
C 11	Chemical Capacitor	3.3μF 50V	05053352
C 12	Ceramic Capacitor	0.022μF50V	05152231
C 13	Ceramic Capacitor	0.022μF50V	05152231
C 14	Ceramic Capacitor	0.022μF50V	05152231
C 15	Ceramic Capacitor	0.022μF50V	05152231
C 16			
C 17	Ceramic Capacitor	470pF 50V	05154713
C 18	Chemical Capacitor	47μF 50V	05024761
C 19			

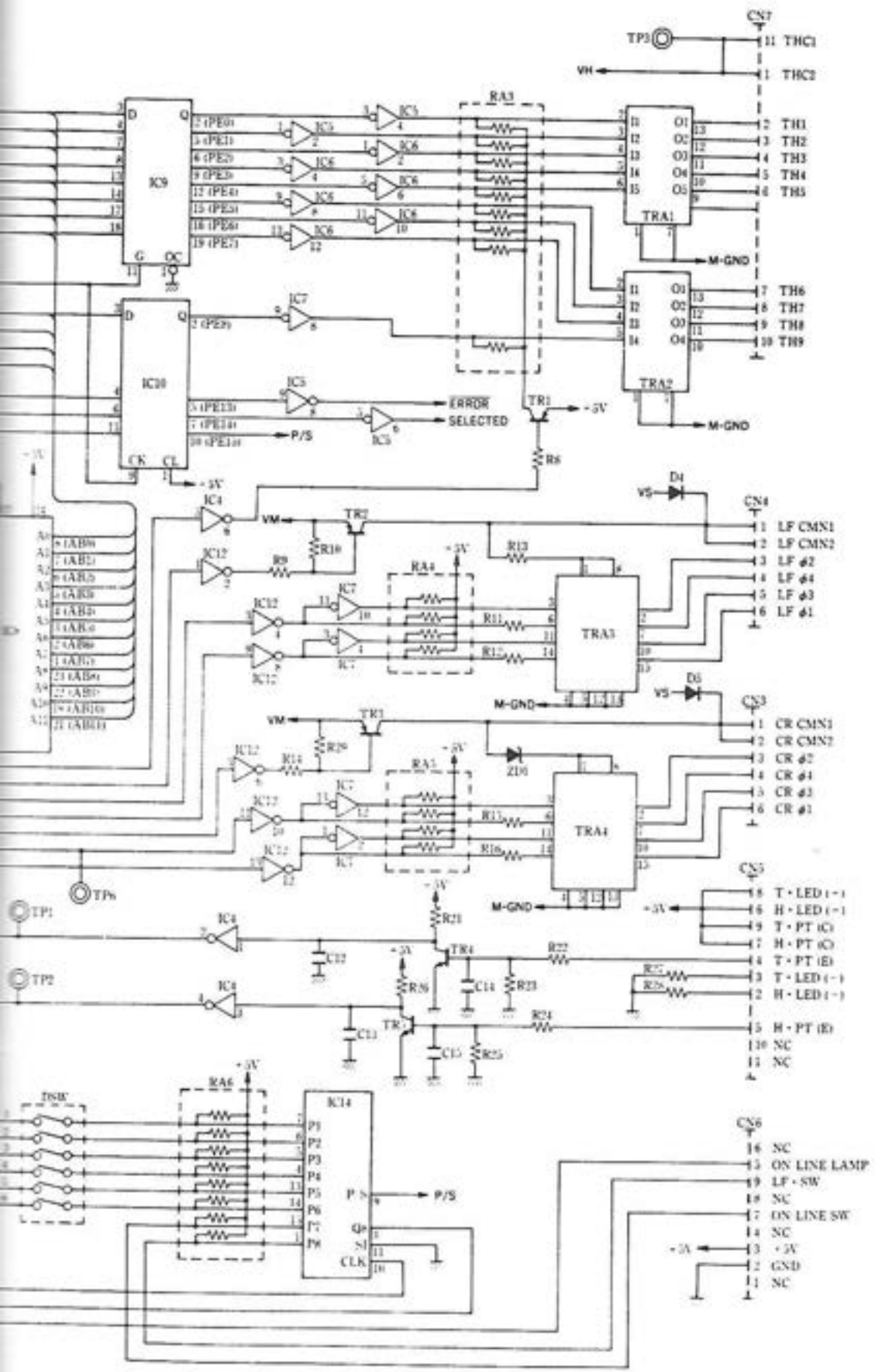
Drwg. No.	Parts Name	Parts Spec.	Parts No.
C 20	Ceramic Capacitor	0.022μF50V	05152231
C 21	Ceramic Capacitor	0.022μF50V	05152231
C 22	Ceramic Capacitor	0.022μF50V	05152231
C 23	Ceramic Capacitor	0.022μF50V	05152231
C 24	Ceramic Capacitor	0.022μF50V	05152231
C 25	Ceramic Capacitor	0.022μF50V	05152231
C 26	Ceramic Capacitor	0.022μF50V	05152231
C 27	Ceramic Capacitor	0.022μF50V	05152231
C 28	Ceramic Capacitor	0.022μF50V	05152231
C 29	Ceramic Capacitor	0.022μF50V	05152231
C 30	Ceramic Capacitor	0.022μF50V	05152231
C 31	Ceramic Capacitor	0.022μF50V	05152231
C 32	Ceramic Capacitor	0.022μF50V	05152231
C 33	Ceramic Capacitor	0.022μF50V	05152231
C 34	Chemical Capacitor	100μF 16V	05021074
X 1	Crystal	NR18-4MHz	09250012
DSW	DIP Switch	KTD-10	09090010
TAB 1	Tab Terminal	46016	09990131
TP 1	Test Point Pin	RT-01T-1.3B	09990114
TP 2	Test Point Pin	RT-01T-1.3B	09990114
TP 3	Test Point Pin	RT-01T-1.3B	09990114
TP 4	Test Point Pin	RT-01T-1.3B	09990114
TP 5	Test Point Pin	RT-01T-1.3B	09990114
TP 6	Test Point Pin	RT-01T-1.3B	09990114
TP 7	Test Point Pin	RT-01T-1.3B	09990114
CN 1	Connector	M57-36-30-135	09100144
CN 2	Connector	5284-07A	09100145
CN 3	Connector	5267-06A	09100127
CN 4	Connector	5267-06A	09100127
CN 5	Connector	5267-10A	09100148
CN 6	Connector	5267-09A	09100149
CN 7	Connector	5229-11CPB	09100151

5-3 Control Logic Board (Part No. 87352011)

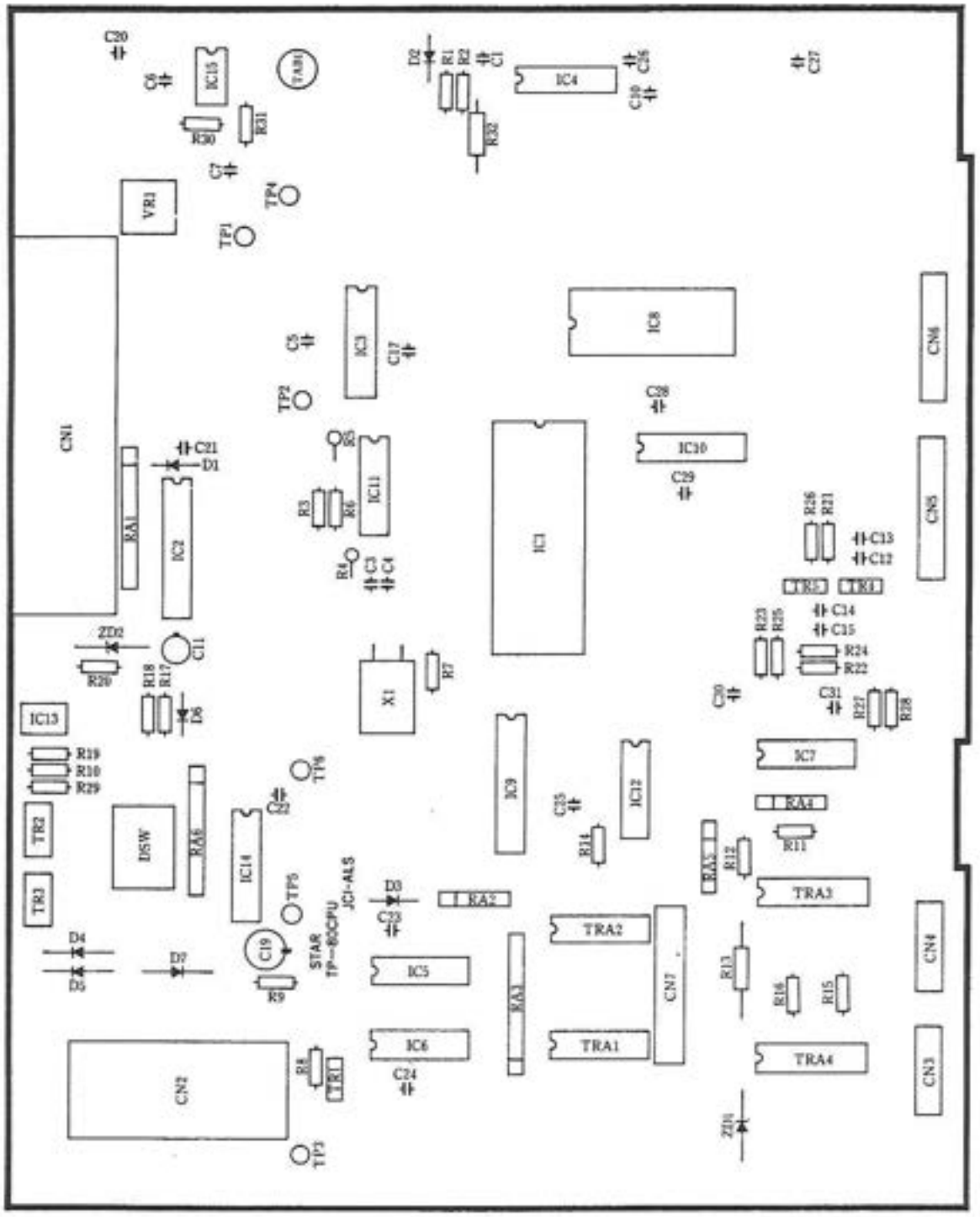
Followings are effective from the Serial No. 6003002250.

(1) Circuit Diagram




CN7
TP3
VH
11 THC1
1 THC2
RA3
IC9
IC10
IC5
IC6
IC7
TRA1
TRA2
M-GND
2 TH1
3 TH2
4 TH3
5 TH4
6 TH5
7 TH6
8 TH7
9 TH8
10 TH9
ERROR
SELECTED
P/S
TR1
-5V
R8
D4
VS
CN4
IC4
VM
TR2
R10
IC12
R9
RA4
R13
TRA3
R11
R12
1 LF CMN1
2 LF CMN2
3 LF φ2
4 LF φ4
5 LF φ3
6 LF φ1
D5
CN3
TR3
R20
ZD1
RA5
TRA4
R14
R15
R16
1 CR CMN1
2 CR CMN2
3 CR φ2
4 CR φ4
5 CR φ3
6 CR φ1
TP5
TP1
TP2
R21
TR4
TR5
R22
R23
R24
R25
C12
C13
C14
C15
R26
R27
CN5
8 T-LED(-)
6 H-LED(-)
9 T-PT(C)
7 H-PT(C)
4 T-PT(E)
3 T-LED(-)
2 H-LED(-)
5 H-PT(E)
10 NC
11 NC
RA6
DSW
IC14
P/S
CN6
16 NC
15 ON LINE LAMP
19 LF-SW
18 NC
17 ON LINE SW
14 NC
13 +5V
12 GND
11 NC

(2) Component Layout



(3) Electric Parts List

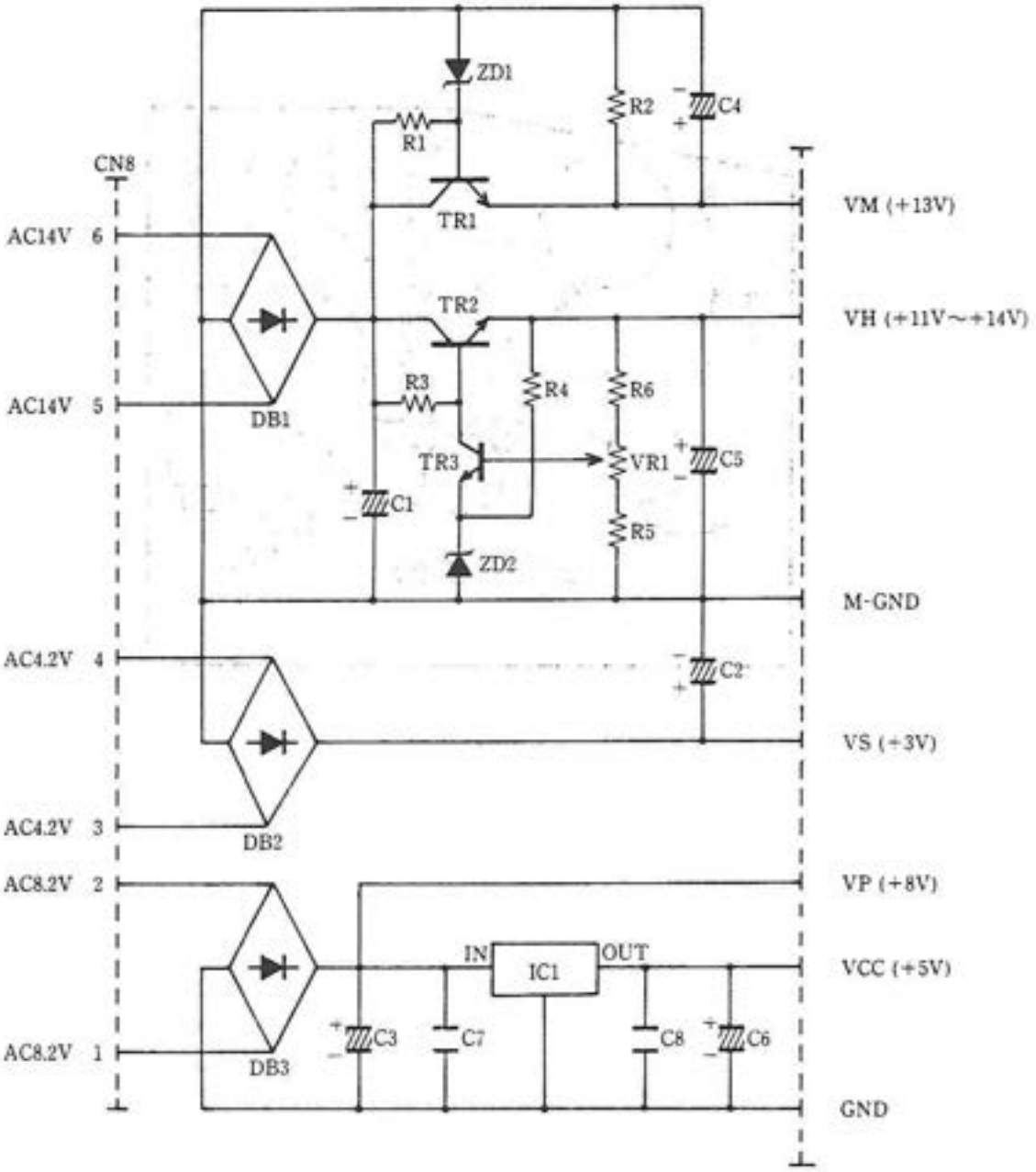
Drwg. No.	Parts Name	Parts Spec.	Parts No.
IC 1	CPU	µPD7800G	08220029
IC 2	TTL	74LS374	08210052
IC 3	TTL	74LS112	08210051
IC 4	TTL	74LS14	08210023
IC 5	TTL	74LS05	08210017
IC 6	TTL	74LS05	08210017
IC 7	TTL	74LS05	08210017
IC 8	ROM	µPD2732D	08220014 *
	(It is necessary to tell the seal mark on the ROM)		
IC 9	TTL	74LS373	08210038
IC 10	TTL	74LS174	08210060
IC 11	TTL	7404	08200009
IC 12	TTL	7406	08210006
IC 13	IC	M51204	08210040
IC 14	IC	HD14014	08210049
IC 15	IC	NE555N	08210008
TRA 1	Transistor Arrey	µPA53C or BA612	07650002
TRA 2	Transistor Arrey	µPA53C or BA612	07650002
TRA 3	Transistor Arrey	M54532P	07650001
TRA 4	Transistor Arrey	M54532P	07650001
TR 1	Transistor	2SA1175 JHFE	07011751
TR 2	Transistor	2SA1261	07012611
TR 3	Transistor	2SA1261	07012611
TR 4	Transistor	2SC2785 JHFE	07227851
TR 5	Transistor	2SC2785 JHFE	07227851
ZD 1	Zener Diode	RD20FB2	08020020
ZD 2	Zener Diode	RD4.7EL1	08020027
D 1	Diode	1S1588	08000001
D 2	Diode	1S1588	08000001
D 3	Diode	1S1588	08000001
D 4	Diode	W03B	08020025
D 5	Diode	W03B	08020025
D 6	Diode	1S1588	08000001
D 7	Diode	W03B	08020025
VR 1	Variable Resistor	100kΩ	06541043
RA 1	Resistor Arrey	4.7kΩ 9-element	06584726
RA 2	Resistor Arrey	4.7kΩ 4-element	06584721
RA 3	Resistor Arrey	1 kΩ 9-element	06581022
RA 4	Resistor Arrey	1 kΩ 4-element	06581023
RA 5	Resistor Arrey	1 kΩ 4-element	06581023
RA 6	Resistor Arrey	10kΩ 8-element	06581032
R 1	Resistor	10kΩ 1/4W	06041031
R 2	Resistor	100Ω 1/4W	06041011

Drwg. No.	Parts Name	Parts Spec.	Parts No.
R 3	Resistor	820Ω 1/4W	06048211
R 4	Resistor	220Ω 1/4W	06042212
R 5	Resistor	220Ω 1/4W	06042212
R 6	Resistor	1.8kΩ 1/4W	06041821
R 7	Resistor	10kΩ 1/4W	06041031
R 8	Resistor	2.2kΩ 1/4W	06042221
R 9	Resistor	470Ω 1/4W	06044711
R 10	Resistor	10kΩ 1/4W	06041031
R 11	Resistor	1 kΩ 1/4W	06041021
R 12	Resistor	1 kΩ 1/4W	06041021
R 13	Resistor	330Ω 2 W	06203311
R 14	Resistor	470Ω 1/4W	06044711
R 15	Resistor	1 kΩ 1/4W	06041021
R 16	Resistor	1 kΩ 1/4W	06041021
R 17	Resistor	100kΩ 1/4W	06041041
R 18	Resistor	100Ω 1/4W	06041011
R 19	Resistor	4.7kΩ 1/4W	06044721
R 20	Resistor	10kΩ 1/4W	06041031
R 21	Resistor	4.7kΩ 1/4W	06044721
R 22	Resistor	270Ω 1/4W	06042711
R 23	Resistor	27kΩ 1/4W	06042731
R 24	Resistor	270Ω 1/4W	06042711
R 25	Resistor	6.8kΩ 1/4W	06046821
R 26	Resistor	4.7kΩ 1/4W	06044721
R 27	Resistor	180Ω 1/4W	06041811
R 28	Resistor	180Ω 1/4W	06041811
R 29	Resistor	10kΩ 1/4W	06041031
R 30	Resistor	100Ω 1/4W	06041011
R 31	Resistor	1 kΩ 1/4W	06041021
R 32	Resistor	1 kΩ 1/4W	06041021
C 1	Ceramic Capacitor	470pF 50V	05154713
C 2			
C 3	Ceramic Capacitor	51pF 50V	05155101
C 4	Ceramic Capacitor	100pF 50V	05151014
C 5	Ceramic Capacitor	470pF 50V	05154713
C 6	Film Capacitor	0.01μF 50V	05251033
C 7	Film Capacitor	0.01μF 50V	05251033
C 8			
C 9			
C 10	Ceramic Capacitor	1000pF 25V	05131021
C 11	Chemical Capacitor	3.3μF 50V	05053352
C 12	Ceramic Capacitor	0.022μF50V	05152231
C 13	Ceramic Capacitor	0.022μF50V	05152231
C 14	Ceramic Capacitor	0.022μF50V	05152231
C 15	Ceramic Capacitor	0.022μF50V	05152231
C 16			
C 17	Ceramic Capacitor	470pF 50V	05154713
C 18			
C 19	Chemical Capacitor	100μF 16V	05021074
C 20	Ceramic Capacitor	0.022μF50V	05152231
C 21	Ceramic Capacitor	0.022μF50V	05152231

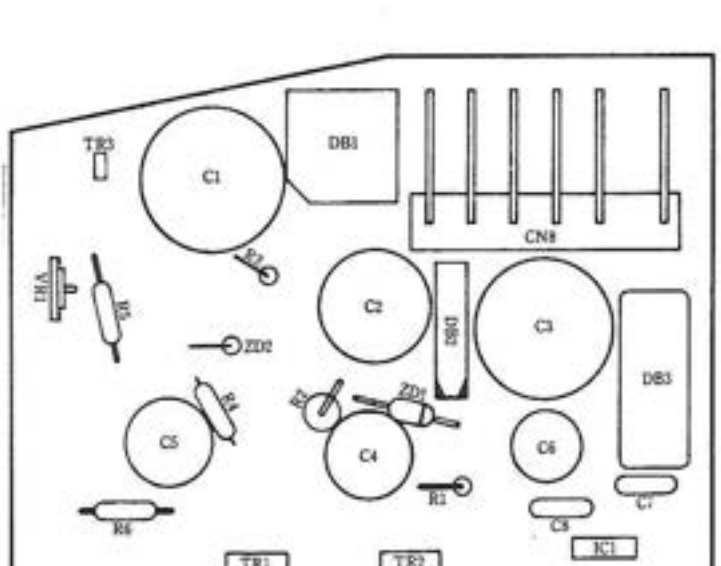
Drwg. No.	Parts Name	Parts Spec.	Parts No.
C 22	Ceramic Capacitor	0.022μF50V	05152231
C 23	Ceramic Capacitor	0.022μF50V	05152231
C 24	Ceramic Capacitor	0.022μF50V	05152231
C 25	Ceramic Capacitor	0.022μF50V	05152231
C 26	Ceramic Capacitor	0.022μF50V	05152231
C 27	Ceramic Capacitor	0.022μF50V	05152231
C 28	Ceramic Capacitor	0.022μF50V	05152231
C 29	Ceramic Capacitor	0.022μF50V	05152231
C 30	Ceramic Capacitor	0.022μF50V	05152231
C 31	Ceramic Capacitor	0.022μF50V	05152231
X 1	Crystal	NR18-4MHz	09250010
DSW	DIP Switch	KTD-06	09090011
TAB 1	Tab Terminal	46016	09990131
TP 1	Test Point Pin	RT-01T-1.3B	09990114
TP 2	Test Point Pin	RT-01T-1.3B	09990114
TP 3	Test Point Pin	RT-01T-1.3B	09990114
TP 4	Test Point Pin	RT-01T-1.3B	09990114
TP 5	Test Point Pin	RT-01T-1.3B	09990114
TP 6	Test Point Pin	RT-01T-1.3B	09990114
CN 1	Connector	R41-5735C	09100155
CN 2	Connector	5284-07A	09100145
CN 3	Connecotr	5267-06A	09100127
CN 4	Connector	5267-06A	09100127
CN 5	Connector	5267-10A	09100148
CN 6	Connector	5267-09A	09100149
CN 7	Connector	5229-11CPB	09100151

5-4 Power Regulator Board

(1) Circuit Diagram



(2) Component Layout

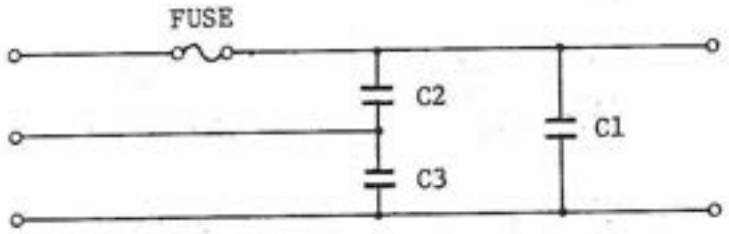


(3) Electric Parts List

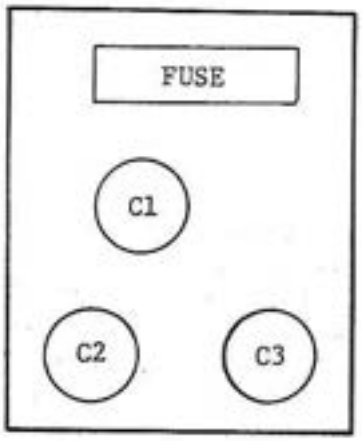
Drwg.No.	Part Name	Parts spec.	Parts No.
IC 1	IC	μPC7805	08200043
TR 1	Transistor	2SD1277B	07312771
TR 2	Transistor	2SD1277B	07312771
TR 3	Transistor	2SC2785 JHFE	07227851
DB 1	Diode Stack	S2VB10	08990207
DB 2	Diode Stack	S1VB10	08990208
DB 3	Diode Stack	S1RBA10	08990209
ZD 1	Zener Diode	RD15EB3	08020032
ZD 2	Zener Diode	RD6.2EB3	08020029
VR 1	Variable Resistor	RV8-FAS 1kΩ	06451022
R 1	Resistor	1 kΩ 1/4W	06041021
R 2	Resistor	1 kΩ 1/2W	06021021
R 3	Resistor	470Ω 1/4W	06044711
R 4	Resistor	1 kΩ 1/4W	06041021
R 5	Resistor	3.3kΩ 1/4W	06043321
R 6	Resistor	2.7kΩ 1/4W	06042721
C 1	Chemical Capacitor	2200μF 25V	05032222
C 2	Chemical Capacitor	2200μF 6.3V	05002281
C 3	Chemical Capacitor	2200μF 16V	05022282
C 4	Chemical Capacitor	470μF 16V	05024772
C 5	Chemical Capacitor	470μF 16V	05024772
C 6	Chemical Capacitor	220μF 6.3V	05002211
C 7	Ceramic Capacitor	0.01μF 50V	05151032
C 8	Ceramic Capacitor	0.01μF 50V	05151032
CN 8	Connector	5288-6A	09100152
	Connector Unit		80921920

5-5 Fuse Board

(1) Circuit Diagram



(2) Component Layout



(3) Electric Parts List

[AC120V]

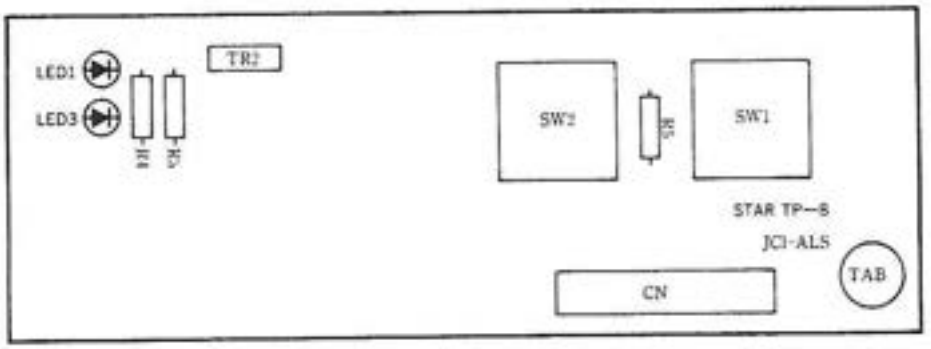
Drwg.No.	Part Name	Parts spec.	Parts No.
Fuse	Fuse	5MT600	09990022
C 1	Ceramic Capacitor	125Z0.01MF17V	05091031
C 2	Ceramic Capacitor	125Z4700PF13V	05094781
C 3	Ceramic Capacitor	125Z4700PF13V	05094781

[AC220V,AC240V]

Drwg.No.	Part Name	Parts spec.	Parts No.
Fuse	Fuse	315mA/250V	09990024
C 1	Ceramic Capacitor	PME265MB510	09990307
C 2	Ceramic Capacitor	PME265MB422	09990308
C 3	Ceramic Capacitor	PME265MB422	09990308

5-6 Control Panel Board

(1) Component Layout



(2) Electric Parts List

Drwg.No.	Part Name	Parts spec.	Parts No.
TR 2	Transistor	2SC2785 JHFE	07227851
LED1	LED	SG240D	08300027
LED3	LED	SG240D	08300027
R 3	Resistor	470Ω 1/4W	06044711
R 4	Resistor	470Ω 1/4W	06044711
R 5	Resistor	4.7kΩ 1/4W	06044721
SW 1	Switch	J-P5029	09010024
SW 2	Switch	J-P5029	09010024
TAB	Connector Pin	46016	09990131
CN	Cable Unit		80921910

THE POWER BEHIND THE PRINTED WORD.

STAR MICRONICS, INC. (N.Y.)

Pan Am Building
Suite 2308
200 Park Ave.
New York, NY 10166
(212) 986-6770

STAR MICRONICS, INC. (DALLAS)

Suite 216
1120 Empire Central Place
Dallas, TX 75247
(214) 631-8560

STAR MICRONICS, INC. (CA.)

#3 Oldfield
Irvine, Ca. 92714
(714) 768-4340

STX80DZ002